/THE MENSTRUAL CYCLE AND FOOD CRAVINGS IN YOUNG COLLEGE WOMEN/

by

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INTRODUCTION

There is an increasing interest in the effects of the menstrual cycle on women's health. Today, the premenstrual tension syndrome is receiving particular attention. The menstrual cycle has been known to affect various metabolic, physical, and psychological factors that influence the well-being of women. Food cravings and menstrual symptoms may occur in varying intensities throughout the menstrual cycle, especially in the premenstrual and menstrual stages of the cycle.

Several previous studies have investigated the effects of the menstrual cycle on the occurence of various menstrual or premenstrual symptoms. Other studies have examined the effect of the menstrual cycle on food intake and/or food craving behavior in women. It is justifiable then, that a trial investigating both the aspects of symptomatology and food craving behavior be conducted on women.

One problem with the previous studies was that it was difficult to identify the specific food components craved by the women. For example, if a woman craves a chocolate candy bar, she could be craving the carbohydrate, the sugar, the chocolate (or a combination of these) all of which are in the candy bar.

Another problem with previous studies was that frequently women were aware that the effect of the menstrual cycle was being studied, which may have influenced their responses.

The present study is an attempt to identify changes in symptomatology and food craving behaviors throughout the menstrual cycle. Cravings for different food components are studied. Also, symptoms and cravings in men and women are compared. It is important to note that the subjects were not informed that the real purpose of the investigation was to study the effect of the menstrual cycle.

REVIEW OF LITERATURE

I. Review of the Menstrual Cycle

Menstruation is the physiological shedding of the uterine endometrium that occurs at approximately monthly intervals from menarche to menopause. The normal menstrual cycle involves growth of the endometrium and development of a mature follicle, ovulation or release of the follicle from the ovary, and a breakdown or shedding of the endometrium producing menstrual bleeding. In Current Obstetrics and Gynecologic Diagnosis and Treatment (5) the menstrual cycle is divided into four phases which are characterized by differences in the endometrium and changes in pituitary and ovarian hormone levels.

The first day of the menstrual cycle begins with the onset of menstrual blood flow and it also marks the beginning of the follicular phase of the cycle. This phase is also called the estrogenic phase because the hormone estrogen is primarily responsible for this stage of endometrial regrowth. Estrogen is released by the developing follicle causing the development of endometrial tissue in the uterus. On approximately the tenth day of this phase or day 14 of the cycle, the late follicular phase ends and ovulation occurs.

Ovulation marks end of the first phase and the beginning of the second phase of the menstrual cycle, which is the luteal phase. Usually ovulation occurs at mid-cycle or day 14 or 15. At this time, the mature follicle is released by the ovary and begins its descent through the oviduct to the uterus. There is no detectable change in the endometrium 24 to 36 hours following ovulation, but the presence of increased levels of lutenizing hormone (LH) and follicle stimulating hormone (FSH) accompany the release of the follicle.

The secretory or progestational phase begins at ovulation and usually lasts 14 days. In the absence of fertilization and implantation the follicle is converted to a hormone-secreting body called the corpus luteum. Therefore, the 14-day period following the release of the mature follicle is sometimes called the luteal phase. Progesterone secretion from the corpus luteum is elevated during the first half of the progestational phase until the corpus luteum begins to regress. At this time both estrogen and progesterone secretions decline. As a result, there are rapid regressive changes in the endometrium during the last two days of this phase (typically days 27 and 28 of the menstrual cycle) and menstruation begins within two or three days.

The degeneration of the endometrium causes tissue necrosis and dilation of blood vessels. The resulting hemorrhages and hematomas cause shedding of the endometrium and rupturing of

small vessels. At this point menstrual bleeding ensues. This phase of the cycle averages three to five days in length.

It is understandable that the menstrual cycle may be accompanied by changes in the body other than those of the reproductive system. There may be fluctuations in body metabolism, alterations of psychological or emotional state, and/or the presence of cyclical physical symptoms related to menstruation. Each of these will be discussed.

II. Effects of the Menstrual Cycle on Metabolism

The basal metabolic rate (BMR) is a physiological measurement which reflects the amount of energy required to sustain normal body functions at rest. The BMR is thought to vary little from day to day in the same individual. However, there is some evidence that the BMR is influenced by the stage of the menstrual cycle.

A nitrogen balance study done by Calloway and co-workers (8) at the University of California at Berkley was done, in part, to determine the influence of the menstrual cycle on protein requirements and nitrogen utilization in young women. Six women between the ages of 19 and 33 years were confined to a metabolic unit and were fed a defined formula diet with progressively decreasing levels of egg white protein. The amount of dietary energy intake was fixed at approximately 38 kcal/kg body weight, and exercise was standardized. All sources of body nitrogen losses were collected and analyzed. The results of the

study showed that the urinary nitrogen excretion varied with the menstrual cycle in all subjects. Urinary nitrogen excretion tended to rise before ovulation, drop to the lowest about the time of ovulation, increase sharply after the ovulatory period, and fall again just before or at the onset of menstruation.

The researchers noted that the positive nitrogen balance recorded at about the time of ovulation coincides with the sharply increased plasma levels of estradiol and FSH, and increased levels of LH typically found at this point in the menstrual cycle. This contrasted with the increased urinary nitrogen excretion during the late luteal phase in which a smaller rise in estradiol was found. There may be a relationship between nitrogen retention or excretion to hormonal patterns, but it was not clear from this study.

Solomon, Kurzer, and Calloway (31) measured BMR, resting metabolic rate (RMR), and energy cost of selected activities in six healthy young women over their menstrual cycles. The results showed that BMR varied significantly with the menstrual cycle in five of the six subjects. There was a decrease in BMR during menstruation which fell to a low point at approximately one week before ovulation, followed by a rise before the next menstrual period. Since energy intake and physical activity were held constant, the changes in BMR during the menstrual cycle were attributed to the cycle itself.

The researchers believed that the change in BMR was due, in part, to fluctuating progesterone levels. Because progesterone

is known to increase body heat production, and its secretion during the menstrual cycle coincides with the observed changes in BMR, it is possible that progesterone increases the BMR. In terms of calorie requirements, there was a difference of .25 kcal/min. or 359 kcal/day when comparing the BMR from its high point (before menstruation) to its lowest point (after ovulation).

Carbohydrate metabolism in the menstrual cycle was studied by Cudworth and Veevers (11). Blood sugar, serum insulin, and growth hormone (GH) levels in response to a 100g oral glucose load were studied on days 9, 18, and 27 of the menstrual cycle in 20 healthy women, aged 18-20 years. The subjects showed no significant differences in blood sugar or insulin levels on the three days of the menstrual cycle tested. The tests were repeated three cycles later on seven women and these tests also did not show any significant differences between the three days. Eleven subjects did exhibit a rise in fasting GH levels on day 27 of their cycles, but the mean difference was not statistically significant. Therefore, the researchers concluded that the changes in endogenous hormone levels during the menstrual cycle do not produce significant alterations in carbohydrate metabolism in normal women of the age group studied.

III. Fluctuations in Sensory Functions During the Menstrual Cycle

There have been several recent studies which document

changes in sensory perceptions during the menstrual cycle. A review conducted by Parlee (19) examined differences in sensory processes including vision, olfaction, audition, taste, and touch. Only the changes in taste and pain sensitivity will be noted.

Parlee found in her review that there is a trend toward reduced pain sensitivity in the premenstrual phase of the cycle when this phase is compared to the menstrual and postmenstrual phases. No patterns emerge when comparing taste sensitivity or preferences. However, Parlee believed that changing hormone levels of the menstrual cycle might possibily influence the central nervous system and taste perceptions during the cycle.

Differences in sweetness preference over the menstrual cycle were reported by Pliner and Fleming (21). Preferences for sucrose solutions were measured both before and after a glucose load during the midluteal and midfollicular phases of the cycle in 41 university employees and students aged 18-41 years. It was found that during the luteal phase (second half) of the cycle there was a marked decrease in pleasantness ratings following the glucose load. However, there was no decrease for subjects in the follicular phase (first half). The authors expected the reverse of these findings and suggest that perhaps glucose clears less rapidly from the blood (following a glucose load) during the luteal phase than during the follicular phase of the cycle. They further hypothesized that if blood glucose levels are correlated with preferences for sugar solutions, and if

blood glucose remains elevated during the luteal phase, then post-load ratings of pleasantness during the luteal phase would be decreased.

IV. Menstrual Symptomatology

Assessment of Menstrual Distress. A menstrual distress questionnaire (MDQ), developed by Moos (15), has been the research tool used by many investigators who have studied menstrual cycle symptomatology. Moos tested 839 women for the occurence of 47 symptoms which had been reported in the literature and by women themselves. One purpose of the study was to develop a standard method which could be used for collecting cross-sectional and longitudinal information on the prevalence and severity of these symptoms. Another purpose was to correlate symptom severity, the influence of age and parity on symptom severity, and the influence of memory with menstrual phase.

The questionnaire was completed by 839 wives of graduate students at a large western university. Each woman was asked to indicate her age, education level, length of marriage, and parity. Additional information about length of menstrual cycle, length of menstrual flow, and cycle regularity was also obtained. The women were then asked to rate their experience of each of the 47 symptoms on the MDQ on a six-point scale ranging from no experience to an acute experience for their most recent cycle, and for their worst cycle. Ratings were completed for menstrual (during menstrual flow), premenstrual (the week before

onset of menstrual flow), and the intermenstrual (remainder of cycle) phases. The symptoms were grouped into eight categories or scales and individual symptom ratings were added to produce a score for each scale. The control symptoms were a list of menopausal symptoms. Table 1 shows the list of symptoms grouped into the different scales. One of the 47 symptoms termed "change in eating habits" was not listed because it could not be located in any of the eight clusters of symptoms present upon factor analysis of the data.

Results of the study showed that it is possible to identify easily the symptom areas and menstrual cycle phase in which most complaints of a woman will be found. He found that older women (31 years and older) have slightly more complaints during the premenstrual phase, while younger women (21 years and younger) show relatively greater symptoms in the menstrual phase of the cycle. Women who answered the questionnaire during the intermenstrual phase showed no tendency to complain either more or less of symptoms than women who answered the questionnaire while in the menstrual or premenstrual phase. Preliminary studies with the MDQ (15) showed that women tended to have generally consistent symptomatology from one menstrual cycle to the next, which indicates the reliability of the MDQ.

Another report by Moos (16) on typology of menstrual cycle symptoms listed more specific information about the group of women used in his previous study (15). The average age of the women was 25.2 years. The average cycle length was 30.3 days,

Table 1. Symptom scales made up from menstrual, premenstrual, intermenstrual, and worst menstrual symptom factor analysis (15)

1. Pain
   - Muscle stiffness
   - Headache
   - Cramps
   - Backache
   - Fatigue
   - General aches and pains

2. Concentration
   - Insomnia
   - Forgetfulness
   - Confusion
   - Lowered judgment
   - Difficulty concentrating
   - Distractible
   - Accidents
   - Lowered motor coordination

3. Behavioral change
   - Lowered school or work performance
   - Take naps; stay in bed
   - Stay at home
   - Avoid social activities
   - Decreased efficiency

4. Autonomic reactions
   - Dizziness, faintness
   - Cold sweats
   - Nausea, vomiting
   - Hot flashes

5. Water retention
   - Weight gain
   - Skin disorders
   - Painful breasts
   - Swelling

6. Negative affect
   - Crying
   - Loneliness
   - Anxiety
   - Restlessness
   - Irritability
   - Mood swings
   - Depression
   - Tension

7. Arousal
   - Affectionate
   - Orderliness
   - Excitement
   - Feelings of well-being
   - Bursts of energy, activity

8. Control
   - Feeling of suffocation
   - Chest pains
   - Ringing in the ears
   - Heart pounding
   - Numbness, tingling
   - Blindspots, fuzzy vision

with slightly over half (54.8%) reporting cycles regular to within + or - 2 days. Moos noted that in general, a woman who reports symptoms in one area also tends to have complaints in another area. There were a number of different groups of typology of symptoms in women, perhaps suggesting that there were women suffering from different types of premenstrual syndrome, and that generalizing all complaints under one syndrome is inaccurate or incomplete. It should be noted that the self-reporting of symptoms in the group of women studied by Moos was a subjective appraisal of symptomatology since each woman judged for herself the incidence and severity of symptoms.

Physical Symptoms Related to the Menstrual Cycle. Other researchers have used the Moos MDQ for their studies of menstrual cycle symptoms. Brooks, Ruble, and Clark (7) studied the expectations, attitudes, and knowledge about menstrual related changes in a group of college women. One hundred ninety-one subjects 19-29 years of age were given a questionnaire consisting of several sections. The first section was the Moos MDQ which they answered both as if they were in their premenstrual and intermenstrual phases. The women rated themselves as having significantly ($P < .001$) more symptoms in the scales of water retention, negative affect, pain, behavioral change, and autonomic reactions for the premenstrual condition. Also for the premenstrual phase they reported less concentration and arousal symptoms. But in general, the findings of this study

indicate that these college women accepted menstruation as routine and did not think of it as overly disruptive.

Sampson and Jenner (26) completed a study on daily recordings from the Moos MDQ in order to compare scores of women with different cycle lengths. Volunteers from a student health center were chosen who were non-complaining and emotionally stable, and who in the researchers' opinion had the same characteristics as a group of patients who complained of premenstrual syndrome. The average age of the subjects was 32.2 years with a range of 24-42 years. Fifteen of the subjects were married. The women completed the MDQ form every evening, beginning with the first day of their menstrual periods and continuing until the sixth day of their next periods. In this way, one complete cycle was studied. Twelve (71%) of the subjects reported experiencing a premenstrual syndrome, and some (an unreported number) termed it 'only slight'. Water retention was the most common symptom and was reported by 82% of the women, while pain was second with an incidence of 71% in these women. Other symptom scales commonly reported in descending order were behavioral change, negative affect, and concentration.

A comparison of three age groups of women attending one family planning clinic was made using the Moos MDQ (25). A total of 392 women completed the questionnaire. An attempt was also made to see if the scores were affected by the stage of the cycle that women were in when completing the MDQ. Cycles were

divided into menstrual, premenstrual (10 days before menses), and postmenstrual (intermenstrual) phases. The first group of women (n=372) ranging in age from 15-55 years were asked to recall dates of their most recent menstrual cycle, and to recall symptoms of this cycle for the three phases designated. The second group, which consisted of 20 students of age 17-22 years completed the MDQ during the three phases of one menstrual cycle. Results were reported for oral contraceptive users and non-pill users for both parts of the study.

In the first group (ages 15-55 years), all the women experienced significantly more premenstrual incidence of pain, water retention, and negative affect. It was found that on the average, the women in this study over 30 years of age complained more of symptoms in the premenstrual and menstrual phases of the cycle than the younger women. Little or no differences were seen in the relationship between the cycle phase a woman was in when she completed a questionnaire and her report of the symptoms. This was tested in the second group of women. So the women did not have a greater tendency to complain of the symptoms experienced in a certain phase simply because they were in that phase when the questionnaire was completed.

In a study by Cox (10) a group of college students completed a daily checklist of 15 symptoms that were associated with menstrual distress. Thirty-five male (mean age 20 years) and 35 female (mean age 20.2 years) psychology students were asked to participate in a study dealing with physical symptoms

among college students. They were not informed that the study had anything to do with the menstrual cycle. A general health section of the questionnaire allowed for the dates of the beginning of the menstrual cycle to be determined. For each female subject, the first three days of menstrual flow were designated "menstrual", the three days preceding flow as "premenstrual", and the three consecutive days midway between cessation of flow and the first premenstrual day as "midcycle". Each female was paired with a male who served as a control and symptom ratings were compared across the same dates. The 15 symptoms used in the study were from the Virginia Inventory of Menstrual Symptoms, which is listed in Appendix Table 1.

None of the symptoms were reported more extensively by females during the premenstrual and midcycle phases as compared to the men in the study. Symptoms of sharp and dull aching cramps, stomach pain and bloating were reported significantly more in females during the menstrual phase. The symptoms that were reported more by females in the menstrual phase were not reported to be substantially distressing to the subjects.

Emotional State and the Menstrual Cycle. Most of the research on menstrual symptomatology covers both the physical and psychological/emotional aspects of menstrual distress. It may be beneficial to review some of the work done specifically on the more emotional symptoms of the menstrual cycle, since these may be as equally distressing as the physical symptoms.

A study of anxiety and mood fluctuation during the menstrual cycle (14) was conducted on 11 women from a university medical center. The age range of the women was from 19-35 years, with a mean of 23 years. None of the women had been on oral contraceptives for at least six months, all had regular menstrual cycles, and were free from medical, psychiatric, and gynecologic symptoms. Each subject was told that the study being conducted dealt with hormonal aspects of the menstrual cycle. The women rated their feelings each evening on the Moos MDQ and a state-trait anxiety scale. The women were studied for a complete cycle, which was divided into six phases: follicular, ovulatory, luteal, late luteal, premenstrual, and menstrual. Time of ovulation was determined by urinary pregnanediol determinations and basal body temperature recordings. The premenstrual phase was the three day period before menstruation. Results showed that negative affect, which is a measure of depression, was not elevated during the premenstrual phase. Water retention was the only MDQ symptom that was rated higher, and this occured during the premenstruum. State anxiety and other psychophysiological symptoms measured by the MDQ did not fluctuate significantly through the menstrual cycle in this group of women.

Measuring subjective appraisals of psychological well being (PWB) in women is one way to determine the effects of the menstrual cycle on emotional state. O'Rourke (18) investigated accounts of PWB and symptom reporting in order to determine if

the source of symptoms was due to the menstrual cycle. A large (n=633) group of women, aged 21-44 years, completed a questionnaire including the General Well Being Schedule (GWB) and the Moos MDQ. The results showed that most of the variance in GWB could be attributed to the way women perceived their health status. An interesting finding was that the incidence of symptoms in these women was related more to their psychological state, than stage of menstrual cycle. In addition, women with menstrual symptoms had a higher level of PWB, probably because the symptoms were menstrual and not stemming from other sources. In summary, the investigator concluded that the women in this study viewed menstruation as routine and not overly disruptive to their psychological state.

Sheldrake and Cormack (28), in their study of 3323 women whose mean cycle length was 29.1 days (excluding pill users), related cycle regularity and length to menstrual symptom reporting. They found that symptoms were reported more frequently by women with long, irregular cycles. Therefore, it is possible that "psychological" symptoms are not caused by anticipation of menstruation, since a woman with very irregular cycles does not know when to expect menstruation. The results also led the authors to suggest that perhaps those women who are more susceptible to emotional disorder are the ones that are more subject to perceived or actual menstrual cycle disturbances. Other interesting findings were that overall, symptoms tended to be more frequently reported by those studying

in the arts rather than the sciences, and those whose birth order position was that of a child who was brought up with older siblings.

A study which involved both women and men who completed daily self-reports on pleasant activities, stressful events, moods, and somatic changes for 35 consecutive days, was conducted by Wilcoxon, Schrader, and Sherif (33). Subjects were not told the real purpose of the study. The 22 women were divided into two groups--half were on the pill and half were not. Eleven men were assigned pseudo cycles and used as controls. Males reported a stable, low level of pain and water retention throughout the study, while both female groups reported an increase during the premenstrual and menstrual phases. The experience of stressful events accounted for more variance than did cycle phase for negative mood factors.

Menstrual Symptomatology and Oral Contraceptive Usage. Since oral contraceptive agents (OCAs) affect not only the reproductive system in women but also metabolism in various ways, a comparison of users and non-users of the pill should be made when reviewing symptomatology. Some women experience side effects while using OCAs including an increase or decrease in appetite and a change in mood. Therefore, much of the literature contains reports comparing those using OCAs and those who were not.

Sampson and Jenner (26) studied menstrual symptoms using the Moos MDQ and found no significant differences in symptom

reporting between pill-takers and non-pill-takers for the women tested.

Brooks, Ruble and Clark (7) looked at the effect of oral contraceptive usage on college women's expectations and attitudes toward their menstrual cycle. They found no significant differences between the two groups. Women who were taking OCAs had the same attitudes and expectations of the menstrual cycle as those who were not taking them.

A few studies reported differences in menstrual symptoms when comparing those taking OCAs and those not taking them. In one report (33) women who took OCAs had the greatest negative affect mood during the premenstrual phase, while women not on OCAs peaked during the menstrual period. Sheldrake and Cormack (28) indicated that women on OCAs reported symptoms less frequently but tended to report depression and tension more often. Women who had been taking OCAs for more than two years reported less symptoms during menstruation and experienced less menstrual pain. In a report on premenstrual tension using the Moos MDQ (25) women who were not on the pill complained of significantly ($P<0.01$) more premenstrual and menstrual symptoms. They also found that older women complained more of menstrual symptomatology than younger women, and this difference was especially noticeable in those not taking oral contraceptives.

V. Premenstrual Syndrome

Premenstrual Syndrome (PMS) or Premenstrual Tension

Syndrome (PMTS) is a topic of increasing interest to researchers. Although there is no universally accepted definition of PMS, it is generally agreed that it involves changes in emotional state and the presence of physical and/or psychological symptoms which usually occur consistently during the premenstrual phase of the menstrual cycle and are less prevalent or absent during other times of the cycle. Generally, symptoms begin some time between ovulation and just prior to the onset of menstruation, and decrease or subside some time during the menses. In some women, the symptoms begin at ovulation and continue on until menstruation. Others have a flare-up of symptoms at the time of ovulation which subside until they begin again later in the premenstrual phase. Some PMS sufferers manifest a gradual increase in symptoms beginning in the post-ovulatory or premenstrual phase which finally peaks and then subsides with menstruation.

There is no one clear cut pattern of PMS among women, because the type and number of symptoms vary, and the exact time that they occur differs among individuals. Morton and colleagues studied premenstrual tension in a group of prison inmates (17). Particular interest to hypoglycemia as a side effect of premenstrual tension was shown by Morton and co-workers in this study. The researchers concluded that 51% of the prison population suffered from premenstrual tension as judged by the high frequency of nervous and emotional symptoms, which reportedly occured monthly and subsided during or after

menstruation. Symptoms were reported more frequently in the 20-30 and 40-50 year age ranges. The average age of the 249 volunteers was 32.4 years. Oral glucose tolerance curves in 12 of the subjects studied showed an increased glucose tolerance. The premenstrual phase used in this study was not defined. The relationship of occurence of violent crimes to phase in the menstrual cycle was also reported. Out of 42 prisoners convicted of violent crimes (murder, manslaughter, and assault), 62% commited the crime while in the premenstrual week of their cycles. This perhaps illustrates the impact that PMS may have on emotional state.

The Premenstrual Assessment Form (PAF) is part of a new procedure used to evaluate behavioral, psychological, and physical changes that occur in some women during the premenstrual period. Halbreich, Endicott, and Schacht (13) used the PAF in their study to illustrate the variety of premenstrual changes which occur in some women. When correctly completed by subjects the PAF gives information on health, menstrual history, and recent cycles as well as indications of incidence and severity of 95 changes in mood, behavior, and physical condition associated with PMS. This form also allows for a brief narrative description (written by the subject) of how the premenstrual period differs from the individual's usual state. In the 154 female student nurses and medical staff studied, 45% met the criteria for a PAF Major Depressive

Syndrome. This includes depressed mood and four of eight associated symptoms. Neither age of the subject nor phase of the menstrual cycle that subjects were in when the PAF was completed affected the type or level of changes associated with the premenstrual period in this study.

A helpful review on PMS written by two medical doctors, Reid and Yen, (24) covers symptoms, pathophysiology, and management of PMS. It reported that PMS may cause disruption in the personal and professional lives of up to 30% of women who are of reproductive age. Symptoms that they report related to PMS include fatigue, emotional lability, depression, bloating, various pains, and an increase in appetite or specific cravings for sweet or salty foods in the premenstrual week. Various factors that are possibly related to pathophysiology of PMS listed by Reid and Yen are: progesterone insufficiency or withdrawal (resulting in a relative estrogen excess), fluid retention, vitamin B-6 deficiency, hypoglycemia, endogenous hormone allergy, psychosomatic dysfunction, hyperprolactinemia, and cyclic changes in endogenous opiate peptides. Although the authors have listed several factors that could be related to PMS, none have been substantiated or endorsed by the medical community or researchers involved in the study of PMS. Reid and Yen also noted that future scientific research and clinical studies on PMS and its treatment are warranted.

VI. The Effect of the Menstrual Cycle on Food Intake and Food Cravings in Women

There is some evidence that the menstrual cycle may change eating behaviors and food cravings in women. Nutritional factors in the assessment of PMS have been studied by a few researchers. Abraham and Lubran (3) studied the relation of magnesium deficiencies to premenstrual tension (PMT). According to the authors, magnesium deficiency may be related to symptomatology of PMT. In this study, measurements of red cell magnesium and serum magnesium in nine normal premenopausal women and 26 patients complaining of PMT symptomatology. Blood samples were taken and analyzed during the mid-luteal phase for all women. It was found that the mean red cell magnesium level was significantly ($P<0.01$) lower in PMT patients. The authors hypothesized that the apparent magnesium deficiency in PMT patients may have been attributed to decreased intake or absorption, or increased renal excretion of magnesium. It was noted that stress-induced magnesium depletion could also be a factor, since stress stimulates the secretion of mineralocorticoids and glucocorticoids, which increase renal excretion of magnesium and decrease intestinal absorption, respectively. Combined with poor dietary intake of magnesium, depletion could occur.

It is interesting to note that Smith (29) observed three depressed female patients, who reported a peculiar and characteristic craving for sweets, particularly chocolate, just

prior to a period of depression. Later it was discovered that they experienced feelings of tension or depression just prior to the onset of each menstrual period and were prone to cravings for sweets at this time. Chocolate is a food that is a substantial source of magnesium. A two ounce chocolate candy bar contains 60mg of magnesium (20), which makes it one of the highest food sources of magnesium.

Smith and Sauder (29) attempted to find a possible relationship between food cravings, depression, and premenstrual problems. A group of 289 nurses aged 19-59 years, with an average age of 25.9 years, answered a questionnaire concerning food cravings and menstrual periods. Among the topics covered by the questions were the occurence of tension, depression, pain, water retention, and compulsive food cravings. The questionnaire was also designed to help determine whether the women were subject to food cravings during times of tension and depression other than during their menstrual periods. The results showed an association between the occurence of cravings for food and/or sweets and premenstrual feelings of tension or depression. There was also an association between cravings at the time of menstrual periods and premenstrual fluid retention, as well as a relationship between depression and premenstrual fluid retention. This may indicate a physiological basis for food cravings. Questions regarding sweets and chocolate were not exclusive and 85% of those who craved chocolate also included themselves in the group that craved sweets. Therefore,

information on those who craved only chocolate was not available.

Abraham (2) reviewed the role of nutrition in PMS. Four PMS subgroups were named and identified. According to Abraham, PMT-A consists of anxiety, irritability, and nervous tension, and is the most commonly occuring subgroup. PMT-H, which is associated with symptoms of water and salt retention, abdominal bloating, mastalgia, and weight gain is the second most common form of PMT. The subgroup characterized by premenstrual cravings for sweets, increased appetite, and indulgence in eating refined sugar followed by palpitation, fatigue, fainting spells, headache and sometimes the shakes, is PMT-C. These patients have increased carbohydrate tolerance and low red cell magnesium, according to Abraham. The least common, but most dangerous subgroup described by Abraham is PMT-D. Suicide is most frequent in this subgroup and associated symptoms are depression, withdrawal, insomnia, forgetfulness, and confusion.

Abraham reports that out of 1,395 gynecologic patients evaluated in the U.S. between 1980 and 1982, 50% scored moderate or severe for one or more of the subgroups (2). PMT-C patients reportedly comprised 24% of the PMS patients. Background research on nutrition and PMT, as well as more detailed descriptions of mechanisms and treatment modes of PMT were reported (1) for 12 years of research work done by Abraham on PMT. A summary of how Abraham formed subgroups was reported in his later article (2).

Studies have been done on variations in food intake during the menstrual cycle (4, 12, 17). Morton and co-workers reported that 37% of 249 prison inmates experienced cravings for sweets in the premenstruum, and 23% claimed to have an increase in appetite at this time of the cycle (17). The researchers noted an 18% improvement in reduction of PMT symptoms in some subjects when the regular prison diet was supplemented with extra milk and cheese, and medication was given. The food supplements given were chosen because of their protein content, which the researchers thought would be beneficial. It was felt that if a high protein diet helped hypoglycemic patients, it might also help PMTS patients, some of which also had hypoglycemic-like reactions during the premenstrual period. The medication consisted of a tablet containing a diuretic, antispasmodic, caffeine, and vitamin B complex.

Dalvit did a double blind study on dietary intakes of eight women aged 18-22 years (12). The subjects of the study did not know the purpose of the investigation and the interviewer did not know the timing of their cycles when food intake surveys were conducted. Mean differences in caloric intake between 10 preovulation and 10 postovulation days for two cycles were calculated. There was a mean difference of approximately 500 calories between the two periods. On the average, the women consumed about 500 more calories per day during the 10 post-ovulatory days than during the 10 pre-ovulatory days.

Another study in which food intake was studied throughout the menstrual cycle involved 23 college females whose mean age was 20 years (4). A 35-day food intake record was recorded by each individual, and dates of the menstrual period were recorded. All cycles were standardized to 28 days by collapsing or expanding the late follicular phase (days seven to 12). On days 18 through day six (10 days premenstrual and six days after the onset of flow), there was a trend for the women to significantly decrease their intake of protein, fat, carbohydrate, and total energy. Thus, during the premenstrual period of approximately 10 days before onset of menstrual flow, there was a marked decrease in food intake in these women.

MATERIALS AND METHODS

Objectives. The overall objective of this study was to examine premenstrual food cravings in young college women using a weekly questionnaire for a period of six weeks. The questionnaire also contained questions on menstrual symptoms and health-related behaviors so that the relationships between these variables and food cravings could be observed. This study was conducted from March 20 through May 1, 1985.

Subjects. Subjects for the study were 83 female and 21 male university students, 18 to 26 years old. The subjects were students enrolled in Basic Nutrition, which is a large introductory course for non-majors taught at Kansas State University, Manhattan, Kansas. This course is usually comprised primarily of young, white, single women. Participation in the study was voluntary; however, an incentive of extra credit points toward the course grade was given to encourage participation. The students were told that the purpose of the study was to identify factors influencing food craving behavior, but were not told that the effect of menstrual cycle was the focal point of interest.

Questionnaire. A copy of the questionnaire appears in Appendix Table 2. It was pilot tested on approximately 35

students having a background similar to those in the study population. The study was conducted in accordance with university policy on human subjects research. The application form and approval letters from The University Human Subjects Research Committee appear in Appendix Tables 3 and 4, respectively. The informed subject consent form is the first page of the questionnaire which explains the project procedures, risks, and benefits.

The questionnaire was administered as several parts: an initial questionnaire for background information on dietary habits, health habits, and menstrual histories of the subjects. Then following on a weekly basis for six consecutive Wednesdays, students received a one-page "craving sheet." The craving sheets were filled out in class (between 10:20 and 11:30 a.m.) each Wednesday to minimize environmental variation.

Administering the craving sheets on a weekly basis for six weeks made it probable to observe each woman at least once during her premenstrual phase. The premenstrual phase was considered one week prior to the onset of menses. Only data from women who had a complete set of six craving sheets were used. Content of the one-page craving sheets is described further below.

The craving sheets were only one page in length to reduce student fatigue and hopefully increase accuracy of response. Each craving sheet had a list of 32 foods and a list of 22 symptoms. Students were asked each Wednesday to rank on a

scale of one to seven their degree of craving or intensity of symptoms. The definition of "crave" given to them was that listed in the Random House Dictionary (32), which was "to long for," "want greatly," or "desire eagerly." Both oral and written instructions for the questionnaires were provided to the students.

The 32 foods used for the craving sheets were taken from several sources. One important source was a 3-day diet analysis completed by the previous semester's Basic Nutrition class. Another source was obtained by asking the study population at the beginning of the semster what foods they craved and conditions under which they craved the foods. Another source was a published study on teenage food habits (27).

The 32 foods were placed in one of six categories based on common characteristics. This was performed so that if food cravings were present, they could be attributed to a certain characteristic, and not a single food. The six categories are: chocolate foods, paired non-chocolate controls, high sugar foods, high starch foods, lower carbohydrate foods, and a miscellaneous list. The responses for chocolate foods and paired non-chocolate controls were compared to single out chocolate as the single food component craved. The food items comprising each list are shown in Table 2. The miscellaneous list included alcohol, coffee, and tea which are common beverages. It also included strawberry and vanilla ice cream because these flavors were an attempt to disguise the obvious appearance of chocolate

Table 2. Food categories used for the present study*

1. Chocolate foods (5)
   - Chocolate cake
   - Chocolate candy bar
   - Chocolate ice cream
   - Chocolate chip cookies
   - Chocolate milk

2. Paired Non-chocolate controls (5)
   - Cake
   - Candy bar
   - Ice cream
   - Cookies
   - Milk

3. Sugar-carbohydrate (7)**
   - Cake
   - Candy bar
   - Ice cream
   - Cookies
   - Donuts
   - Pie
   - Soft drinks

4. Starch-carbohydrate (7)
   - Popcorn
   - French fries
   - Bread or rolls
   - Crackers
   - Potato chips
   - Cereal
   - Noodles or rice

5. Lower Carbohydrate (7)
   - Peanut butter
   - Hamburger
   - Hot dog
   - Chicken or turkey
   - Pizza
   - Taco or nachos
   - Ham or bacon

6. Other (5)
   - Alcoholic beverages
   - Strawberry ice cream
   - Vanilla ice cream
   - Coffee
   - Tea

*Foods selected from previous semesters three-day diet analyses for this class and hence believed to be well-liked. Also these foods were previously reported to be well-liked by similar populations (27). Subjects were asked during six consecutive Wednesdays to indicate their degree of craving for each food on a scale of 1 to 7 where 7 represents maximum degree of craving.
**Four of these items were also used as paired chocolate controls.

several times in the list of foods. The food list was randomized for each craving sheet.

Each craving sheet also contained a list of 15 menstrual symptoms taken from the Virginia Inventory of Menstrual Symptoms (Appendix Table 1) used by Cox (10). An additional six control symptoms were taken from the Blatt Menopausal Index (6). These are symptoms that are experienced by postmenopausal women and would not be expected to be exhibited by our menstruating population. The symptom lists were also randomized for each craving sheet. A list of symptoms is shown in Table 1.

Each craving sheet also asked students about other factors, including dieting habits, hours of sleep the previous night, breakfast that morning, and date of last menstrual period. From the latter question the stages of the menstrual cycle could be determined for each sheet when examining all six craving sheets for a given individual, because the six-week period covers one complete menstrual cycle for most women. Subjects who could not consistently (and reliably) recall the date of their last period were excluded from the study.

Determination of menstrual cycle stage. At the end of the study, the initial questionnaires and six craving sheets were collated, and a determination of menstrual cycle stage was made for each sheet. The menstrual cycle was broken down into four stages. The first stage was menstrual flow. The second stage was the first half of the cycle excluding menstrual flow (probably pre-ovulatory). The third stage was the second half of the cycle

Table 3. Symptoms used for the present study*

1. Menstrual Symptoms (15)**
   - Sharp cramps
   - Dull, aching cramps
   - Nausea
   - Upset stomach
   - Headache
   - Backache
   - Weakness
   - Diarrhea/constipation
   - Stomach pain
   - Facial blemishes
   - General aching
   - Irritability
   - Depression
   - Tension (nervousness)
   - Feeling bloated

2. Post Menopausal Symptoms (6)***
   - Feeling of suffocation
   - Chest pains
   - Ringing in the ears
   - Heart pounding
   - Numbness, tingling
   - Blind spots, fuzzy vision

3. Other (1)
   - Boredom

*Subjects were asked during six consecutive Wednesdays to indicate their intensity of each symptom on a scale of 1 to 7 where 7 represents maximum intensity.
**Symptoms used in the Virginia Inventory of Menstrual Symptoms (10).
***Symptoms used in the Blatt Menopausal Index (6).

excluding one week premenstrual (probably post-ovulatory). The fourth stage was one week premenstrual or one week prior to the onset of menstrual flow. The exact date of ovulation could not be determined in the study but was assumed to be approximately mid-cycle (between second and third stages) for our subjects.

Data analysis. Data were then coded into a computer as seven separate files (one initial and six craving sheets), which were then merged during analysis. Data for each file were entered twice and then compared to assure accuracy of data entry. All statistical tests were conducted using Statistical Analysis Systems (SAS) computerized programs.

To assess differences in food cravings and menstrual symptoms between different stages of the menstrual cycle, Least Significant Differences tests were performed following significant ($p<0.05$) Analysis of Variance Procedures (22). A copy of the computer program is shown in Appendix Table 7. Comparison between the premenstrual stage and other stages merged was accomplished using Student's t Test (23). Comparison of responses between men and women were also performed using Student's t Test.

An attempt to correlate symptoms with food cravings was made using the PROC CORR procedure. However, most variables were significantly ($p<0.05$) correlated with each other--probably because some people were "hyper-responders" and simply tended to score all items higher than others. To correct for this, an

alternative correlation program was run which compared responses to a baseline which was the mean of all six craving sheets. This program was intended to reduce variation attributed by individuals and also the day tested. A partial copy of the computer program is shown in Appendix Table 8. But again, most of the food cravings and symptoms were correlated with each other, and the results from this procedure are not included in this study.

For each food group craved, a regression model was developed that identified significant determinants (symptoms) explaining that model. This was accomplished after an initial STEPWISE (backwards) procedure, which eliminated non-significant determinants one by one in each step. The stepwise model selected was that which had the lowest error mean square and the lowest Mallow Cp statistic, or C(P) as it appeared in the print-out, relative to the number of variables at that step (regression df in the print-out). Usually the lowest error mean square occured at the step prior to that for the lowest relative Mallows Cp statistic, and a judgement was made concerning which step to use. To reduce variation attributed to individual student responses, the variables allfoods and test were included in the list of independent variables. Allfoods is the sum of craving scores for all foods tested and test is the sum of all symptoms tested. A copy of the computer program is shown in Appendix Table 9.

The variables that were significant ($p<0.10$) in the selected stepwise model for each food group were entered into the regression model (PROC REGR). The variables allfoods and test were again entered as the first two independent variables with the significant symptoms. A copy of the computer program is in Appendix Table 10. The stepwise and regression procedures are explained in Cohen and Cohen (9). The SAS programs were selected from two SAS manuals (22, 23).

RESULTS

Although 168 respondents completed the study, some were excluded from the final population studied because of their menstrual history or factors affecting their eating habits. Women that were excluded and reasons for their exclusion include the following: 21 had irregular periods; 13 were Black, Asian, or Hispanic; eight were married, separated, pregnant, or had children; eight were over the age of 30; six had health problems; and three had food allergies. There was some overlap between these groups so that women may have been excluded for more than one reason. The 83 subjects remaining were a rather homogeneous group of white, single, childless females who were menstruating normally, and had no history of disease that interfered with dietary intake. Twenty-six men completed the study, but several were excluded from the study population including two with health problems, one who was Black, one who was married, and one who was over the age of 30. Twenty-one white, single males remained in the study population.

Characteristics of the study population are presented in Table 4. The mean age, height, and weight for men and women, and the mean menstrual cycle length are reported. The average woman was 19.8 years of age, 65.6 inches in height, and weighed 130.7 pounds. The average man was 21.6 years of age, 71.3 inches in

Table 4. Characteristics of 83 young college women and 21 young college men used in the present study

	Women (no.=83)	Men (no.=21)
Age	19.8 ± 1.0*	21.6 ± 2.1
Height (in)	65.6 ± 2.5	71.3 ± 2.7
Weight (lb)	130.7 ± 1.2	172.8 ± 25.9
Classification, % of students		
Freshman	34.9	0
Sophomore	42.2	28.6
Junior	12.0	23.8
Senior	9.6	47.6
Other	1.2	0
College, % of students		
Home Economics	33.7	23.8
Arts & Sciences	45.8	47.6
Other	20.5	28.6
Regularity of menstrual cycle**		
fairly regular	76.0	—
somewhat irregular	16.0	—
very irregular	5.0	—
Use of oral contraceptives at beginning of study, % of students	27.7	—
Average length of menstrual cycle (days)	28.4 ± 3.6	—

*Mean ± standard deviation.
**Fairly regular= same number of days ± 3 days; somewhat irregular= variation 4-10 days; and very irregular= variation) 10 days.

height, and weighed 172.8 pounds. Percent of students by classification (freshman, sophomore, junior, senior, or other), college, menstrual cycle regularity, and oral contraceptive usage are listed. The majority of the female students were freshmen and sophomores (77.1%), whereas only 28.6% of the male students were in these classifications. About half the subjects were in the College of Arts and Sciences, with the other half from Home Economics or other colleges.

Data on the menstrual cycle of females is reported here. The majority (78%) of the women reported a regular cycle (same number of days ± three days), 16% reported a somewhat irregular cycle (variation four to 10 days), and 5% reported a very irregular cycle (variation greater than 10 days). Oral contraceptives were used by 27.7% of the population at the beginning of the study. The average cycle length was 28.4 days for the women.

Usual consumption of all foods tested is in Appendix Table 5 and craving for individual food items within each list is in Appendix Table 6. Food craving scores and menstrual symptom scores for men and women (all stages merged) are shown in Table 5. Mean scores for food groups craved and also for menstrual symptoms differed between men and women. The women scored significantly ($p<0.05$) lower than the men for the non-chocolate control foods and for chocolate difference scores. This means that when given a choice between chocolate and non-chocolate paired foods, women prefer the chocolate more than the men do.

Table 5. Food craving scores and menstrual symptom scores compared between 83 young college women and 21 young college men*

PARAMETER	GENDER: Women (no.=98)	GENDER: Men (no.=126)
Foods craved**		
Chocolate foods	8.91 ± 5.32	9.91 ± 7.07
Non-chocolate controls	8.89 ± 4.86	10.51 ± 6.95#
Chocolate difference	-0.05 ± 2.89	0.60 ± 2.15#
High sugar foods	14.24 ± 6.59	14.79 ± 5.66
High starch foods	12.42 ± 6.21	12.54 ± 6.51
Lower carbohydrate foods	13.75 ± 6.54	14.67 ± 8.29
Alcohol	1.59 ± 1.31	1.66 ± 1.43
Menstrual symptom		
Sharp cramps	1.17 ± 0.81	1.17 ± 0.89
Dull, aching cramps	1.53 ± 1.01	1.34 ± 0.86
Nausea	1.20 ± 0.78	1.13 ± 0.46
Upset stomach	1.31 ± 0.98	1.26 ± 0.88
Headache	1.87 ± 1.56	1.44 ± 1.11#
Backache	1.53 ± 1.12	1.63 ± 1.22
Weakness	1.44 ± 1.00	1.48 ± 0.86
Diarrhea or constipation	1.19 ± 0.77	1.12 ± 0.66
Stomach pain	1.35 ± 0.99	1.54 ± 1.21
Facial blemishes	1.69 ± 1.19	1.79 ± 1.30
General aching	1.46 ± 1.09	1.61 ± 1.19
Irritability	1.78 ± 1.34	1.81 ± 1.37
Depression	1.57 ± 1.45	1.81 ± 1.31
Tension (nervousness)	2.26 ± 1.64	2.10 ± 1.49
Feeling bloated	1.77 ± 1.45	1.23 ± 0.68#

*Mean ± standard deviation. Score indicates intensity of response for each variable tested on a scale of one to seven with the high score indicating a greater intensity. All variables were tested in each subject on six consecutive Wednesdays.
**Foods in each group are defined in Table 2. Individual food items shown in Appendix Table 5.
#Men differ significantly ($p<0.05$) from women using Student's t test.

The symptoms of headache and feeling bloated were the only symptoms that differed significantly ($p<0.05$) between men and women, with the men scoring lower than the women.

Food craving scores and menstrual symptoms for women during different stages of the menstrual cycle are presented in Table 6. Significant ($p<0.05$) differences were seen for scores for chocolate difference, alcohol, dull aching cramps, and feeling bloated. The women scored the greatest chocolate difference during menstrual flow. This means that if women are presented with a chocolate food and its non-chocolate control during their menstrual flow, they are most likely to select the chocolate food. The mean score for dull, aching cramps was greater for the premenstrual week than the first half of the cycle (excluding menstrual flow) or the second half (excluding premenstrual), and it was the greatest during menstrual flow. Feelings of bloatedness were rated higher for the second half of the cycle (excluding premenstrual) than for the first half (excluding menstrual flow). Bloatedness was rated the highest during menstrual flow and the lowest during the first half of the cycle excluding menstrual flow.

There were no significant differences in symptom or food craving scores when comparing the premenstrual week to non-premenstrual stages (merged) in the women (shown in Table 7).

Parameter estimates for significant determinants of cravings for the food groups used in this study, and their level of significance, are reported for women/all stages merged,

Table 6. Food craving scores and menstrual symptom scores during different stages of the menstrual cycle in 63 young college women*+

PARAMETER	STAGE OF MENSTRUAL CYCLE			
	Menstrual flow (no.=83)	First half excluding menstrual flow (no.=182)	Second half excluding premenstrual (no.=104)	One week premenstrual (no.=125)
Foods craved++				
Chocolate foods	9.76 ± 6.13	8.65 ± 4.92	8.64 ± 4.92	8.90 ± 5.60
Non-chocolate controls	8.92 ± 5.24	8.89 ± 4.70	8.77 ± 4.39	8.98 ± 5.22
Chocolate difference	-0.84 ± 2.73a#	0.15 ± 3.24b	0.15 ± 2.51b	0.0a ± 2.66b
High sugar foods	14.67 ± 7.45	14.83 ± 6.52	14.31 ± 5.99	14.28 ± 6.61
High starch foods	12.17 ± 6.38	12.62 ± 6.19	12.65 ± 6.51	12.05 ± 5.99
Lower carbohydrate foods	13.13 ± 6.46	13.64 ± 6.27	14.48 ± 6.88	13.71 ± 6.70
Alcohol	1.58 ± 1.23	1.47 ± 1.10	1.63 ± 1.37	1.74 ± 1.56
Menstrual symptom				
Sharp cramps	1.40 ± 1.13	1.12 ± 0.72	1.12 ± 0.64	1.15 ± 0.78
Dull, aching cramps	1.80 ± 1.45a	1.19 ± 0.76b	1.16 ± 0.70b	1.36 ± 1.09bc
Nausea	1.18 ± 0.50	1.17 ± 0.76	1.23 ± 0.88	1.22 ± 0.87
Upset stomach	1.31 ± 0.90	1.25 ± 0.89	1.37 ± 1.09	1.31 ± 1.05
Headache	1.81 ± 1.44	2.01 ± 1.66	1.75 ± 1.46	1.81 ± 1.56
Backache	1.65 ± 1.21	1.41 ± 1.01	1.58 ± 1.13	1.57 ± 1.16
Weakness	1.39 ± 0.73	1.46 ± 1.07	1.50 ± 1.07	1.38 ± 1.01
Diarrhea or constipation	1.16 ± 0.63	1.16 ± 0.71	1.25 ± 0.94	1.22 ± 0.77
Stomach pain	1.41 ± 0.95	1.32 ± 0.93	1.35 ± 1.11	1.34 ± 0.99
Facial blemishes	1.87 ± 1.21	1.81 ± 1.15	1.94 ± 1.23	1.98 ± 1.23
General aching	1.47 ± 0.99	1.40 ± 1.00	1.51 ± 1.17	1.50 ± 1.21
Irritability	1.83 ± 1.30	1.75 ± 1.36	1.83 ± 1.30	1.74 ± 1.39
Depression	1.87 ± 1.30	1.97 ± 1.47	2.10 ± 1.62	1.93 ± 1.35
Tension (nervousness)	2.39 ± 1.67	2.37 ± 1.77	2.12 ± 1.42	2.16 ± 1.60
Feeling bloated	2.49 ± 2.01a	1.41 ± 0.91b	1.68 ± 1.31c	1.88 ± 1.58c

*Mean ± standard deviation. Score indicates intensity of response for each variable tested on a scale of one to seven with the high score indicating a greater intensity. All variables were tested in each subject on six consecutive Wednesdays.
++Foods in each group are defined in Table 2.
#Means within the same row having different superscripts differ significantly ($p<0.05$) using Least Significant Differences Tests following significant ($p<0.05$) Analysis of Variance procedures.

Table 7. Food craving scores and menstrual symptom scores in 63 young college women compared between premenstrual and non-premenstrual stages*

PARAMETER	STAGE OF MENSTRUAL CYCLE: Non-premenstrual (no.=369)	One week premenstrual (no.=129)
Foods craved**		
Chocolate foods	9.17 ± 5.76	8.90 ± 5.60
Non-chocolate controls	5.28 ± 5.43	8.98 ± 5.22
Chocolate difference	0.09 ± 2.78	0.40 ± 2.68
High sugar foods	14.40 ± 7.50	14.20 ± 6.81
High starch foods	12.54 ± 6.34	12.09 ± 5.99
Lower carbohydrate foods	13.39 ± 6.99	13.71 ± 6.70
Alcohol	1.57 ± 1.27	1.74 ± 1.56
Menstrual symptom		
Sharp cramps	1.18 ± 0.78	1.15 ± 0.76
Dull, aching cramps	1.32 ± 0.95	1.36 ± 1.09
Nausea	1.17 ± 0.69	1.22 ± 0.87
Upset stomach	1.33 ± 0.93	1.31 ± 1.05
Headache	1.77 ± 1.47	1.81 ± 1.56
Backache	1.54 ± 1.13	1.57 ± 1.18
Weakness	1.47 ± 0.97	1.38 ± 1.01
Diarrhea or constipation	1.17 ± 0.74	1.22 ± 0.77
Stomach pain	1.40 ± 1.05	1.34 ± 0.99
Facial blemishes	1.64 ± 1.21	1.58 ± 1.23
General aching	1.43 ± 1.03	1.50 ± 1.21
Irritability	1.73 ± 1.34	1.74 ± 1.39
Depression	1.94 ± 1.44	1.93 ± 1.39
Tension (nervousness)	2.25 ± 1.62	2.16 ± 1.60
Feeling bloated	1.60 ± 1.26	1.68 ± 1.58

*Mean ± standard deviation. Score indicates intensity of response for each variable tested on a scale of one to seven with the high score indicating a greater intensity. All variables were tested in each subject on six consecutive Wednesdays. There were no significant ($p<0.05$) differences when comparing women in the premenstrual stage with those in the non-premenstrual stages (merged) using Student's t test.

**Foods in each group are defined in Table 2.

women/premenstrual, and men (Tables 8, 9, and 10, respectively). Because there were many symptoms and food cravings only the major patterns and trends will be pointed out here, although all data are presented in the tables.

When observing menstrual symptoms as determinants of food cravings for women/all stages, one general observation is that most menstrual symptoms that were significant determinants were positive determinants of that food craving (Table 8). This means that when the food craving was present, it could be at least partly explained by the presence of that symptom. Backache, facial blemishes, and tension were all positive determinants of craving for chocolate foods and non-chocolate control foods. Positive determinants of high starch foods were stomach pain, irritability, and depression. Sharp cramps was a negative determinant of craving for high sugar foods.

Determinants of food cravings for women in their premenstrual week are listed in Table 9. There are three main general observations or differences when viewing determinants of food cravings for this period compared to those of women/all stages. More symptoms were determinants of chocolate difference during the premenstrual period (Table 9) than during women/all stages (Table 8). Positive determinants of chocolate difference during the premenstrual phase were sharp cramps, dull aching cramps, and nausea. Stomach pain was a negative determinant of chocolate difference. Another important observation was that four of the menstrual symptoms were positive determinants of

Table 8. WOMEN/ALL STAGES: Parameter estimates for significant determinants of each food group's regression model*

Symptom	Chocolate foods	Non-Chocolate controls	Chocolate Difference	High Sugar foods	High Starch foods	Lower Carbohydrate foods	Alcoholic beverages
Sharp cramps				-0.54#			+0.24#
Dull, aching cramps							-0.23#
Nausea							
Upset stomach							
Headache							
Backache	+0.36#	+0.26#					
Weakness	+0.37#						
Diarrhea-constipation		+0.44##	+0.52#				
Stomach pain		-0.32#			+0.61##		
Facial blemishes	+0.27#	+0.26#					
General aching							
Irritability					+0.42##		
Depression		-0.20#			+0.26#		
Tension (nervousness)	+0.34##	+0.22#					-0.14##
Feeling bloated							
R-SQUARE	.71	.78	.03	.75	.79		.24
No. pos. determinants	4	4	1	0	3	0	1
No. neg. determinants	0	2	0	1	0	0	2
Total no. determinants	4	6	1	1	3	0	3
Appendix Table	11	12	13	14	15	16	17

*Initially the independent variables (symptoms) were screened using a stepwise backwards procedure, and significant ($p(0.10)$ variables were used in the regression model. Parameter estimates and significance levels shown here were obtained from the regression model. Variables which were not significant at the $p(0.05$ level are not shown.
#Significant at the $p(0.05$ level.
##Significant at the $p(0.01$ level.

Table 9. WOMEN/PREMENSTRUAL: Parameter estimates for significant determinants of each food group's regression model*

Symptom	Chocolate foods	Non-Chocolate controls	Chocolate Difference	High Sugar foods	High Starch foods	Lower Carbohydrate foods	Alcoholic beverages
Sharp cramps	-1.16#		+1.03#	-1.84##	+1.41#		+0.54#
Dull, aching cramps		+0.86#	+1.16##				-0.64##
Nausea			+1.21#			-2.25##	
Upset stomach						+1.47#	-0.80##
Headache							
Backache	+0.63#	+0.81##				-1.60##	
Weakness		+0.99##					
Diarrhea-constipation							
Stomach pain	+1.43##		-0.95#	+2.14##	-1.05#	-2.92##	
Facial blemishes				+0.96##		-0.86#	
General aching							
Irritability				+0.70#			
Depression						-0.54##	
Tension (nervousness)		+0.56##		+0.95##	-0.78##	-1.12##	
Feeling bloated						-1.06##	
R-SQUARE	.80	.82	.23	.75	.79	.81	.35
No. pos. determinants	2	4	3	4	1	1	1
No. neg. determinants	1	0	1	1	2	7	2
Total no. determinants	3	4	4	5	3	8	3
Appendix table	11	12	13	14	15	16	17

*Initially the independent variables (symptoms) were screened using a stepwise backwards procedure, and significant (p(0.10) variables were used in the regression model. Parameter estimates and significance levels shown here were obtained from the regression model. Variables which were not significant at the p(0.05 level are not shown.
#Significant at the p(0.05 level.
##Significant at the p(0.01 level.

craving for high sugar foods. They were stomach pain, facial blemishes, irritability, and tension. In contrast there were seven menstrual symptoms that were negative determinants of craving for lower carbohydrate foods. They were nausea, backache, stomach pain, facial blemishes, depression, tension, and feeling bloated. Negative determinants of craving for alcoholic beverages were dull aching cramps and upset stomach.

The determinants of cravings for food groups for the men are summarized in Table 10. In general fewer of the menstrual symptoms were determinants of the food cravings for the men than for the women, and no general patterns emerged. Stomach pain and irritablity were negative determinants of craving for high sugar foods but headache was a positive determinant. Positive determinants of craving for lower carbohydrate foods were diarrhea/constipation, stomach pain, and depression. Nausea was a negative determinant of craving for lower carbohydrate foods. Positive determinants of craving for alcoholic beverages were upset stomach and feeling bloated.

Table 10. MEN: Parameter estimates for significant determinants of each food group's regression model*

Symptom	Chocolate foods	Non-Chocolate controls	Chocolate Difference	High Sugar foods	High Starch foods	Lower Carbohydrate foods	Alcoholic beverages
Sharp cramps							
Dull, aching cramps							
Nausea						-2.05#	
Upset stomach							+0.50#
Headache				+1.02#			
Backache							
Weakness							
Diarrhea-constipation	+0.66#				-1.42##	+1.15#	
Stomach pain				-1.72##		+1.16##	
Facial blemishes							
General aching							
Irritability				-1.14##			
Depression						+0.76#	
Tension (nervousness)							
Feeling bloated							+0.37#
R-SQUARE	.91			.87	.63	.63	.21
No. pos. determinants	1	0	0	1	0	3	2
No. neg. determinants	0	0	0	2	1	1	0
Total no. determinants	1	0	0	3	1	4	2
Appendix Table	11	12	13	14	15	16	17

*Initially the independent variables (symptoms) were screened using a stepwise backwards procedure, and significant (p(0.10) variables were used in the regression model. Parameter estimates and significance levels shown here were obtained from the regression model. Variables which were not significant at the p)0.05 level are not shown.
#Significant at the p(0.05 level.
##Significant at the p(0.01 level.

DISCUSSION

The mean length of the women's menstrual cycles in the present study was 28.4 ± 3.6 days, which was similar to the mean cycle length (in days) reported by other investigators which were 28.8 (4), 29.7 (8), 28.2 (11), 29.5 (15), 30.3 (16), 28.6 (26), 29.1 (28), and 29.5 (31).

Among the 83 women participating in this study, 27.7% were taking oral contraceptives, which was comparable to 22.8% of college women (n=3323) reported in a study by Sheldrake and Cormack (28), and 27.3% of the college women (n=191) participating in a study by Brooks et al. (7).

Cycle regularity for subjects in the present study was somewhat similar to that reported by Sheldrake and Cormack (27). They reported that out of the 3,323 women they studied, 6.7% were regular to the day, 62.8% were regular to within a "few days," and 21% were termed "fairly irregular" or "extremely irregular." In the present study 78% were regular to the day or within three days, and a total of 21% reported variation in cycle length of greater than three days.

The menopausal symptoms used in the questionnaire were originally intended to be used as control symptoms, but were eliminated from the study because of the high frequency with which this population reported those symptoms. This conflicts

with the findings of Moos (14) who found no elevation in these control symptoms during any stage of the menstrual cycle. In this study, failure of the menopausal symptoms to act as controls could have been due to room testing conditions or improper interpretation of what the meanings of the symptoms were.

A review of the literature revealed that none of the previous studies known to this investigator compared food cravings of women with men. Significant differences ($p<0.05$) were shown by this study where the men had greater cravings for non-chocolate control foods, and had less incidence of headache and bloated feelings. It should be noted that women scored lower on chocolate difference scores, which indicates that if given a choice, the women in this study were more likely to choose a chocolate food than its paired non-chocolate control. This finding will be discussed in more detail later in the discussion section.

Previous studies have compared men and women for incidence of premenstrual and menstrual symptoms (10, 33). Cox compared 35 men and 35 women for menstrual symptomatology using The Virginia Inventory of Menstrual Symptoms (Appendix Table 1). It should be noted that Cox compared different menstrual cycle stages than the present study. These included three menstrual days, three premenstrual days, and three mid-cycle days (midway between the menstrual days, and the premenstrual days of the subsequent cycle). Comparisons can be made, however, between Cox's study

and the present one, because both studies used the same list of menstrual symptoms for detecting incidence of menstrual symptomatology. There were no differences in symptom ratings in men and women during the premenstrual and mid-cycle stages in Cox's study. Overall, Cox found significantly ($p<0.05$) greater incidence of symptoms including bloating, stomach pain, dull, aching cramps, and sharp cramps in women than men, but only when comparing men to women who were in menstrual flow. In the present study, there were no direct comparisons of men to women in the menstrual flow stage for either menstrual symptoms or food cravings. Therefore, the results cannot be compared directly with those of Cox, but for women/all stages merged there was a greater incidence of headache and bloating than for men.

Of particular interest in the present study was the effect of menstrual cycle on craving for chocolate foods. Smith and Sauder who studied premenstrual cravings for sweets and chocolate, and found that 85% of those who reported cravings for chocolate also included themselves in a group that craved sweets (29).

Because chocolate foods are usually sweet, it is difficult to separate out the craving for chocolate specifically, so in the present study subjects were presented with a list of chocolate foods and their non-chocolate counterparts (e.g., milk and chocolate milk). The chocolate difference was the craving score for the non-chocolate control minus that for the chocolate

food, so the chocolate difference reflected the craving specifically for chocolate. The more negative the number, the more the subject craved chocolate over its non-chocolate control. None of the other previous studies had examined chocolate as a single food component.

In this study, chocolate difference scores were significantly ($p<0.05$) lower during menstrual flow than during the other stages of the cycle, indicating that women, if given a choice between a chocolate food and its non-chocolate control, would be more likely to choose the chocolate food during menstrual flow than other menstrual stages.

It is interesting to note that Abraham studied magnesium levels in premenstrual tension patients and non-premenstrual tension patients and found that serum magnesium levels were significantly ($p<0.01$) lower in the PMT patients (3). Abraham, who has done extensive research in the area of premenstrual tension and nutrition, has reported that certain PMT patients exhibit increased appetite and cravings for sweets (and chocolate). This may indicate that low serum magnesium levels in PMT patients are part of a physiological basis for cravings for chocolate, because chocolate is a fairly good source of magnesium.

Several studies have shown that increases in appetite and cravings for sweet foods may occur in the luteal and premenstrual stages of the menstrual cycle. Dalvit studied food intake and the menstrual cycle (subjects were not aware that

this was being tested) and found a mean difference in food intake of 500 kcal during the luteal and follicular phases, with the higher intake during the luteal phase (12). Morton et al. found that among 249 women studied during the premenstrual stage, 37% had cravings for sweets and 23% had an increased appetite (17). Another study found a decrease in appetite in 20% of the subjects and an increase in appetite in 61% of the subjects (13). An association between cravings for food and/or sweets and certain premenstrual symptoms was found in women (during the premenstrual stage of the cycle) who were studied by Smith and Sauder (29). Solomon's findings in the women she studied showed an average difference of 359 kcal per day in the BMR from its high point, before menses, to its low point, after ovulation (31). These findings perhaps indicate that in some women there is an increase in food intake and/or food cravings during particular stages of the menstrual cycle, and that these phenomena may have a physiological basis. However, there were no significant differences in the food groups tested in the present study.

A study related to nutrient metabolism and the menstrual cycle was done by Cudworth and Veevers (11). Carbohydrate metabolism in the menstrual cycle was studied. The researchers concluded that in the women tested there was no intramenstrual cyclic variation in carbohydrate metabolism.

Symptoms which differed among the various stages of the menstrual cycle can be compared to previous studies. Moos found

that younger women (21 years and younger) had more complaints of menstrual symptoms during the menstrual rather than premenstrual phase of the cycle (15). Table 6 shows that dull, aching cramps and feeling bloated were rated the highest by the subjects during menstrual flow as compared to other stages of the cycle. Wilcoxon et al. performed a study in which subjects were informed that "mood and body awareness" was being studied. The researchers reported that stressful events accounted for more of the variance in menstrual symptoms with the exception of pain and water retention (33). Females in this same study reported significantly ($p<0.05$) greater pain and water retention during the menstrual phase, and four days premenstrually, than during the intermenstrual (or mid-cyle) phase. Of interest in that study is that negative mood factors (such as irritability and tension) were affected more by stressful events than the menstrual cycle itself.

In the present investigation, negative mood factors were not significantly affected by menstrual cycle stage. Water retention was the foremost menstrual complaint in women studied by Sampson and Jenner (26), which was the only symptom that increased significantly ($p<0.05$). Subjects in a study by Brooks et al. rated menstrual symptoms as if they were premenstrual and as if they were intermenstrual, and results showed that they reported significantly more water retention, negative affect, and pain when answering questionnaires as if they were in the premenstrual phase of the cycle (7). Water retention was the

only significant ($p<0.0001$) symptom group which varied through the menstrual cycle in subjects studied by Lahmeyer et al. (14). In that study, water retention progressively increased throughout the cycle, and peaked during the premenstrual phase.

Rouse found significant increases in pain, water retention and negative affect symptom groups during menstruation in subjects taking OCAs (25). Women who were not taking OCAs in Rouse's study reported a decrease in pain, water retention and negative affect when menstruation commenced. In the present study, symptoms were compared for women taking OCAs and those not taking them, but no significant differences were found, so results were not reported in this study.

An attempt was made to identify significant determinants (menstrual symptoms) for cravings for certain food groups. Data were reported for women/all stages, women/premenstrual, and men in tables 8, 9, and 10, respectively. Although there were no significant differences between food group cravings and stage of the menstrual cycle (except for chocolate difference during menstrual flow) certain menstrual symptoms were positive or negative determinants for cravings for certain food groups.

For women/all stages there were a total of 18 menstrual symptoms that were determinants of food cravings--13 were positive determinants and five were negative determinants of food cravings.. For women/premenstrual there were a total of 30 determinants of food cravings, 16 of which were positive, and 14 of which were negative.

For men overall there were fewer menstrual symptoms as determinants of cravings for certain food groups--a total of only 11, with seven positive determinants and only four negative determinants.

When looking at the data for the women/all stages there were more than twice as many positive determinants as negative determinants. However, during the premenstrual stage, there were almost as many negative determinants as positive determinants of food cravings. This may indicate that the women who suffered from menstrual symptomatology were more likely to experience negative influences on craving behavior during the premenstrual stage.

Although overall patterns of determinants of food cravings were difficult to identify, a few patterns did emerge. For women/all stages menstrual symptoms were positive determinants of cravings for chocolate foods, and high starch foods. During the premenstrual stage, the pattern was somewhat similar in that the menstrual symptoms were generally positive determinants of cravings for high carbohydrate foods, and menstrual symptoms were generally negative determinants of cravings for lower carbohydrate foods. So the message here is that women who experience symptoms may report cravings for the high carbohydrate foods, and at the same time manifest less craving for the lower carbohydrate foods.

It is interesting to note that Smith and Sauder found an association between the occurence of cravings for food and/or sweets and premenstrual feelings of tension or depression (29). Results of their study showed that tension was a significant ($p<0.01$) positive determinant of craving for high sugar foods in the women who were within seven days premenstrual during the study. During the premenstrual phase in the present study, tension was a positive determinant of cravings for high sugar foods, as well as non-chocolate controls, and depression was a negative determinant of cravings for lower carbohydrate foods. These results are in agreement with Smith and Sauder.

Perhaps a point that deserves mention is that in all but two of the previous studies subjects were aware that the effect of the menstrual cycle was being studied. This may have influenced subjects to respond differently than if they had not been aware of the real purpose of the study. Since the subjects for the present study were not informed that the effect of the menstrual cycle on food cravings was being studied the validity of the results may be greater than if they had been aware of the real purpose of the study. Validity of results may also have been increased if a larger sample of men had been available for participation. Also because only negative symptoms were studied students may have tended to respond more negatively than if positive symptoms had been added to the list of symptoms. In addition, it may have been helpful when comparing differences in cravings between men and women, if men could have been matched

in pairs with the women and assigned pseudo-cycles, so that women in the premenstrual stage could have been compared directly to men who were answering questionnaires at the same time.

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APPENDIX

Appendix Table 1

Virginia Inventory of Menstrual Symptoms

Date_____ Time_____ SS#_____

DAILY SYMPTOM SCALE

Place a check for each of the following items corresponding to how you feel right now. Be as accurate and as honest as possible. Right now, at this moment, I am experiencing or feeling:

	None	1	2	3	4	5	6	7	Extreme
Sharp cramps									
Dull, aching cramps									
Nausea									
Upset stomach									
Headache									
Backache									
Weakness									
Diarrhea or Constipation									
Stomach pain									
Facial blemishes									
General aching									
Irritability									
Depression									
Tension (nervousness)									
Feeling bloated									

Please answer the following questions:

1. Have you experienced a cold or flu in the last 24 hours? yes no
2. Did your menstrual flow period begin in the last 24 hours? yes no
3. Did you get seven hours or more of sleep last evening? yes no
4. Have you smoked a cigarette in the last 24 hours? yes no

Used in: Cox, DJ. 1983. Menstrual symptoms in college students: a controlled study. J. Behav. Med. 6(3):335-338.

Appendix Table 2

EXTRA CREDIT
Basic Nutrition
Mar. 20,1985

Page a
Student form

The purpose of this study is to examine food craving behavior of college students. This is not required for Basic Nutrition and you will not be penalized if you don't participate. But if you complete the study as indicated you will receive 20 extra credit points which can be added to your total number of points, including those accumulated before the final.

The project is divided as follows:

1. One initial questionnaire (attached) on your background, health habits, food habits, etc. This is to be completed today, March 20, 1985.

2. Six one-page food craving sheets each handed out in class on the next six Wednesdays after the initial questionnaire. This means they will be given out March 27, April 3, 10, 17, 24, and May 1. They will also be due on the days that they were handed out. Each week's sheet will be a different color so that we can organize them better.

   Specifics on the food craving sheets. Please read carefully! It is very important that these sheets be filled out in a specific way so we have consistent testing conditions and complete, meaningful results. Do ALL of the following for the full 20 extra credit points.

   1. All 6 craving sheets must be done on the indicated Wednesdays in our usual lecture hall. If you miss one you can get only 10 points, if you miss two or more, zero points. The only excuse accepted will be a physician's written note. No other exceptions. You will not be allowed to take a missed one at a later date.
   2. Each sheet must be filled out completely.
   3. Sheets will be available on the front table from 10:20 to 11:29 am on Wednesday, or as soon as the previous class has left and before the next class arrives. So you can fill them out before or after class, or even during class if you find time.
   4. Turn in the craving sheets by 11:29 am or before in class on the day it was handed out. There will be a box provided for you to put them in. This means that you must come to class on those days indicated. If you must leave soon after filling out the craving sheet and cannot stay for lecture, put it in the box, and leave quietly so you do not disturb others (try to sit in the front row to fill it out). I will not look kindly on those who arrive at 11:25 and zip through the craving sheets in a few minutes -- it is better to come early. Late craving sheets will not be accepted.
   5. Each sheet must have your name on it so I know it belongs to you, and can give you credit for it.

If you have any questions, call me at school (532-5508) or at home (539-7070), or call Gina Tomelleri, graduate student, at home (539-7273).

Because this study will be used for research, your signature is required under the Informed Subject Consent below. Information from this study will be coded onto computer disk by an arbitrary I.D. number so it will not be possible to identify which answers are yours. The information will be destroyed at the end of the study.

***

INFORMED SUBJECT CONSENT

I have read and understand the instructions given above. As indicated by my signature below and being of sound mind, I do hereby voluntarily consent to serve as a subject in the proposed procedure identified and explained above for the study entitled "Food craving behavior of college students" dated March, 1985.

Printed name LAST _____ FIRST _____ AGE _____ SIGNATURE _____ DATE _____

EXTRA CREDIT
Basic Nutrition
Mar. 20,1985

The purpose of this study is to examine food craving behavior of college students. This is not required for Basic Nutrition and you will not be penalized if you don't participate. But if you complete the study as indicated you will receive 20 extra credit points which can be added to your total number of points, including those accumulated before the final.

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1. One initial questionnaire (attached) on your background, health habits, food habits, etc. This is to be completed today, March 20, 1985.

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   1. All 6 craving sheets must be done on the indicated Wednesdays in our usual lecture hall. If you miss one you can get only 10 points, if you miss two or more, zero points. The only excuse accepted will be a physician's written note. No other exceptions. You will not be allowed to take a missed one at a later date.
   2. Each sheet must be filled out completely.
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INFORMED SUBJECT CONSENT

I have read and understand the instructions given above. As indicated by my signature below and being of sound mind, I do hereby voluntarily consent to serve as a subject in the proposed procedure identified and explained above for the study entitled "Food craving behavior of college students" dated March, 1985.

Printed name LAST _____ FIRST _____ AGE _____ SIGNATURE _____ DATE _____

INITIAL QUESTIONNAIRE
Wednesday, March 20, 1985

Student No._____

Name_____
Last First

Instructions. Circle the ONE best answer or fill in the blanks as applicable. You will not be graded on whether your answers are "correct" or "healthy". It is far more important to give honest answers-- we want to find out what factors influence your own personal food choices. Just ignore the blanks to the right of the questions, they are for computer scoring.

(computer scoring only)

I. BACKGROUND

1. Age (at last birthday)____years

2. Gender: 1. male 2. female

3. How many children do you have: 1. none 2. one 3. two 4. three or more

4. Classification: 1. Freshman 2. Sophomore 3. Junior 4. Senior 5. Other

5. College (your major):
   1. Agriculture
   2. Architecture
   3. Arts & Sciences
   4. Home Economics
   5. Business Administration
   6. Engineering
   7. Education
   8. Vet Sciences

6. Ethnic/Racial Classification
   1. White (non-Hispanic)
   2. Black (non-Hispanic)
   3. Asian or Pacific
   4. American Indian
   5. Hispanic
   6. Other (name)_____

7. In what type of housing do you presently live?
   1. dormitory
   2. sorority or fraternity house
   3. apt/room off campus (without parents)
   4. Home with parents
   5. Other (name)_____

8. In what state and country have you lived MOST of your life?_____ _____
   State Country

9. How many credits are you taking this semester?____credits

II. FOOD HABITS (Again, be honest. You will not be graded on whether your answers are "nutritional" or not.)

10. How often do you usually eat breakfast?
    1. every or usually every day
    2. 3-6 times a week
    3. 1-2 times a week
    4. less than once a week

11. Where is most of your food prepared?
    1. home or apartment
    2. campus food hall or union
    3. sorority or fraternity
    4. off-campus restaurants or fast-food places
    5. from vending machines
    6. other_____

12. How many meals a week do you usually get from on-campus food centers? This means the total from the residence food halls and the union. Select closest one:
    1) none 2) 1-4 3) 5-9 4) 10-14 5) 20

13. Which meal plan are you on at the present?
    1) I am not on any set meal plan associated with the university
    2) Residence food hall meal plan (20 meals/week)
    3) Union Food Plan (A) - 3 meals a day (Mon-Fri)
    4) Union Food Plan (B) - 2 meals a day (Mon-Fri)
    5) Union Food Plan (C) - 1 meal a day (dinner)(Mon-Fri)
    6) Union Food Plan (O) - 1 meal a day (lunch)(Mon-Fri)

14. During what time of the day do you eat MOST of your food?
    1. Morning (5am-11am)
    2. Mid-day (11am-4pm)
    3. Late afternoon (4pm-7pm)
    4. Evening (7pm-11pm)
    5. Night (11pm-5am)

15. How often do you take nutritional supplements (eg vitamin pills)?
    1. daily or usually every day
    2. 3-6 times a week
    3. 1-2 times a week
    4. less than once a week

    If you do take nutritional supplements, what kind are they? (circle all that apply)
    1. combined multi-vitamin and mineral supplement
    2. vitamins only
    3. minerals only (eg iron)
    4. other (specify)_____

16. Does your religion affect the foods you eat? (eg Catholic restrictions on meat during Lent)? 1. yes 2. no

    If so, what foods do you restrict and when?_____

Below is a list of foods. I am asking you to tell me how often you usually eat each food , based on the last two months. Please be honest and do not worry about whether your responses seem "nutritional" or not. Put an "X" under the appropriate column for the average number of times you usually consume the food (just ignore the numbers on top of the columns, they are just the computer code).

		(1) 2x a day or more	(2) Twice a day	(3) Once a day	(4) Several times a week	(5) Once a week	(6) Less than once a week	(7) Rarely if ever	(computer scoring)
17.	Hamburger								
18.	Soft drinks								
19.	Popcorn								
20.	Cake (any type)								
21.	Chocolate cake								
22.	Chocolate candy bar								
23.	Peanut butter								
24.	Chocolate milk								
25.	Pizza								
26.	Donuts								
27.	Chocolate chip cookies								
28.	Alcoholic beverages								
29.	Strawberry ice cream								
30.	Hot dog								
31.	Milk (any type)								
32.	Candy bar (any type)								
33.	Cereal								
34.	Tacos or nachos								
35.	Cookies (any type)								
36.	Potato chips								
37.	Rice and noodles								
38.	Breads and rolls								
39.	Chocolate ice cream								
40.	Coffee								
41.	French fries								
42.	Pie								
43.	Ice cream (any flavor)								
44.	Crackers								
45.	Vanilla ice cream								
46.	Tea								
47.	Chicken or Turkey								
48.	Ham or Bacon								

* Do you have allergies to any of the foods above? (eg chocolate, dairy products, strawberry foods, etc.) If so please place an "I" to the left of the foods that you are allergic to or cannot tolerate physically.

III. HEALTH HABITS

46. What is your height (w/out shoes): _____ft _____in

47. What is your weight (in light clothing) _____pounds

48. How much did you weigh when the semester started? _____pounds

49. How do you consider your present health:
1. excellent 2. very good 3. good 4. fair 5. poor

50. Do you have any illness or condition which interferes with your eating, digestion, or appetite?
1. yes 2. no

If so, please describe the illness _____

51. Are you presently taking any medications (excluding birth control pills) that might affect your appetite? 1. yes 2. no

If so, what is the medication and what is it being used to treat?

_____

52. Do you have diabetes (diagnosed by a physician)? 1. yes 2. no

53. Do you have hypoglycemia (diagnosed by a physician)? 1. yes 2. no

54. Do you smoke cigarettes? 1. yes 2. no

If so, how many cigarettes a day do you smoke? _____cigarettes

55. How often do you get vigorous continuous exercise lasting at least 20 minutes at a time. Examples of vigorous continuous exercise are running, cycling, swimming, jumping rope, dancing, racketball, or tennis. They have to be at least 20 minutes and continuous (non-stop) to count.
1. Daily
2. 5-6 times a week
3. 3-4 times a week
4. once or twice a week
5. less than once a week

IV. WOMEN ONLY (Men skip this section)

56. When was your last period? Give month and day as accurately as you can.

_____ _____
Month Day

57. How often do you have your periods (eg, if someone has her period every 28 days) Give the one number you believe to be the most representative

_____days

58. What is the approximate regularity of your menstrual cycles?

1. fairly regular (same number of days + or - 3 days)
2. somewhat irregular (variation 4-10 days)
3. very irregular (variation greater than 10 days)
4. do not menstruate

59. Are you pregnant? 1. yes 2. no

60. Are you presently taking birth control pills?
1. yes 2. no

If so, have you been taking them for the last: 6 months? 1. yes 2. no

12 months? 1. yes 2. no

Is there anything else we should know before we test your particular craving profile? Indicate below

IV. CHANGES IN FOOD HABITS

The purpose of this page is to see if there has been a change in your eating habits since the beginning of the semester, or from the first day of class. (Please be honest now!). Do not worry about whether your answers are "nutritional" or not -- it is far more important to get an accurate idea of your real eating habits. If there is any particular reason you can think of that explains any of the changes, write it in the margin.

A. Since the beginning of the semester, has there been a change in the AMOUNT you eat of each of the following? If it is the same now or there has been no change, you'd circle a "4" in the middle column. If you have been eating more or less, indicate the degree of change by circling the appropriate number on either side.

(Computer Scoring only)

	Much less now			SAME			Much more now	
								___ (1-3)
Foods made with sugar - - -	1	2	3	4	5	6	7	___ (5)
Dairy products - - - - - - -	1	2	3	4	5	6	7	___ (6)
Fatty foods - - - - - - - - -	1	2	3	4	5	6	7	___ (7)
Fruits - - - - - - - - - -	1	2	3	4	5	6	7	___ (9)
"Diet" or low calorie foods -	1	2	3	4	5	6	7	___ (10)
Salty foods - - - - - - - -	1	2	3	4	5	6	7	___ (11)
High fiber foods - - - - - -	1	2	3	4	5	6	7	___ (13)
Vegetables - - - - - - - -	1	2	3	4	5	6	7	___ (14)
Breads and cereals - - - - -	1	2	3	4	5	6	7	___ (15)
Fried foods - - - - - - - -	1	2	3	4	5	6	7	___ (17)
Meat in general - - - - - - -	1	2	3	4	5	6	7	___ (18)
Vitamin pills or nutritional supplements	1	2	3	4	5	6	7	___ (19)

B. Since the beginning of the semester, has there been a change in the AMOUNT you eat from each of the following? If it is the same now or there has been no change, you'd circle a "4" in the middle column. If you have been eating more or less, indicate the degree of change by circling the appropriate number on either side.

	Much less now			SAME			Much more now	
McDonalds - - - - - - - - -	1	2	3	4	5	6	7	___ (21)
Pizza Hut - - - - - - - - -	1	2	3	4	5	6	7	___ (22)
Dairy Queen - - - - - - - -	1	2	3	4	5	6	7	___ (23)
Hardees - - - - - - - - -	1	2	3	4	5	6	7	___ (25)
Long John Silvers - - - - -	1	2	3	4	5	6	7	___ (26)
Burger Chef - - - - - - - -	1	2	3	4	5	6	7	___ (27)
Taco Tico - - - - - - - - -	1	2	3	4	5	6	7	___ (29)
Taco Bell - - - - - - - - -	1	2	3	4	5	6	7	___ (30)
Kentucky Fried Chicken - - -	1	2	3	4	5	6	7	___ (31)
Wendys - - - - - - - - - -	1	2	3	4	5	6	7	___ (33)
Vista - - - - - - - - - -	1	2	3	4	5	6	7	___ (34)
Taco Hut - - - - - - - - -	1	2	3	4	5	6	7	___ (35)

C. Since the beginning of the semester, about how much of the time have you spent on a WEIGHT LOSS DIET?

1. 0% (Have not dieted at all)
2. 1-10% of the time
3. 11-25% of the time
4. 26-50% of the time
5. 51-75% of the time
6. More than 75% of the time

___ (37)

INSTRUCTIONS: Fill in your student number, complete all sections and return to me in class by 11:29 am. Ignore the blanks to the right of each rating scale, they are just for computer scoring

NAME _____
Last First

1. What is your marital status?
1) single 2) married 3) separated 4) divorced

March 27, 1985 Sequence#: 1

Foods* Indicate on a scale of 1 to 7 how much you "crave" each of the following right now, at this very minute (circle one)

	None						Extreme	
1. Coffee	1	2	3	4	5	6	7	
2. Crackers	1	2	3	4	5	6	7	
3. Hamburger	1	2	3	4	5	6	7	
4. Milk	1	2	3	4	5	6	7	
5. Potato chips	1	2	3	4	5	6	7	
6. Strawberry ice cream	1	2	3	4	5	6	7	
7. Pizza	1	2	3	4	5	6	7	
8. Alcoholic beverages	1	2	3	4	5	6	7	
9. Hot dog	1	2	3	4	5	6	7	
10. Cake	1	2	3	4	5	6	7	
11. Candy bar	1	2	3	4	5	6	7	
12. Nuts or beans	1	2	3	4	5	6	7	
13. Noodles or rice	1	2	3	4	5	6	7	
14. Donuts	1	2	3	4	5	6	7	
15. Peanut butter	1	2	3	4	5	6	7	
16. Chocolate cake	1	2	3	4	5	6	7	
17. Ice cream	1	2	3	4	5	6	7	
18. Tacos or nachos	1	2	3	4	5	6	7	
19. French fries	1	2	3	4	5	6	7	
20. Tea	1	2	3	4	5	6	7	
21. Vanilla ice cream	1	2	3	4	5	6	7	
22. Chocolate chip cookies	1	2	3	4	5	6	7	
23. Chocolate ice cream	1	2	3	4	5	6	7	
24. Popcorn	1	2	3	4	5	6	7	
25. Soft drinks	1	2	3	4	5	6	7	
26. Chocolate milk	1	2	3	4	5	6	7	
27. Chicken or turkey	1	2	3	4	5	6	7	
28. Bread or rolls	1	2	3	4	5	6	7	
29. Pie	1	2	3	4	5	6	7	
30. Cereal	1	2	3	4	5	6	7	
31. Cookies	1	2	3	4	5	6	7	
32. Chocolate candy bar	1	2	3	4	5	6	7	

Symptoms* Indicate on a scale of 1 to 7 how much you are experiencing each of the following symptoms right now, at this very minute (circle one)

	None						Extreme	
33. Depression	1	2	3	4	5	6	7	
34. Diarrhea or constipation	1	2	3	4	5	6	7	
35. Numbness, tingling	1	2	3	4	5	6	7	
36. Stomach pain	1	2	3	4	5	6	7	
37. Chest pains	1	2	3	4	5	6	7	
38. Tension (nervousness)	1	2	3	4	5	6	7	
39. Feeling of suffocation	1	2	3	4	5	6	7	
40. Nausea	1	2	3	4	5	6	7	
41. Boredom	1	2	3	4	5	6	7	
42. Dull, aching cramps	1	2	3	4	5	6	7	
43. Backache	1	2	3	4	5	6	7	
44. Heart pounding	1	2	3	4	5	6	7	
45. Irritability	1	2	3	4	5	6	7	
46. General aching	1	2	3	4	5	6	7	
47. Feeling bloated	1	2	3	4	5	6	7	
48. Sharp cramps	1	2	3	4	5	6	7	
49. Headache	1	2	3	4	5	6	7	
50. Ringing in the ears	1	2	3	4	5	6	7	
51. Dizziness, fuzzy vision	1	2	3	4	5	6	7	
52. Upset stomach	1	2	3	4	5	6	7	
53. Facial blotches	1	2	3	4	5	6	7	
54. Weakness	1	2	3	4	5	6	7	

Stress* Indicate on a scale of 1 to 7 how much stress you feel right now, at this very minute, due to each of the following.

	None						Extreme	
55. School-work stress	1	2	3	4	5	6	7	
56. Personal relationship (family) stress	1	2	3	4	5	6	7	
57. Personal relationship (other than family) stress	1	2	3	4	5	6	7	
58. Financial stress	1	2	3	4	5	6	7	
59. Job stress (answer only if you have a job)	1	2	3	4	5	6	7	
60. Health problems	1	2	3	4	5	6	7	

61. Did you fill in your NAME? 1. yes 2. no

62. Compared to usual, how much total food did you eat during the last 24 hours?
1. Definitely less than usual
2. Somewhat less than usual
3. Usual
4. Somewhat more than usual
5. Definitely more than usual

63. Did you have breakfast this morning?
1. No, I didn't eat anything
2. Just coffee or tea
3. Yes, a little breakfast with food or beverage other than coffee or tea
4. Yes, a moderate-size breakfast
5. Yes, a large breakfast

64. Are you on a special diet right now?
1. No
2. Yes, on a weight loss diet
3. Yes, special diet other than weight loss (Specify)_____

66. Have you experienced a cold or flu in the last 24 hours? 1. yes 2. no

66. Did you get seven hours or more of sleep last evening? 1. yes 2. no

67. Have you smoked a cigarette in the last 24 hours? 1. yes 2. no

WOMEN ONLY (Answer last 3 questions)

68. Did your period start within the last 24 hours? 1. yes 2. no

69. When was your last period? (month and date)_____

70. This question pertains to the stage of menstrual cycle that you are in right now. Consider your menstrual cycle as being broken down in to the first half, and the second half, with day 1 as the beginning of menstrual flow. During which of the following "stages" are you in right now?
1. menstrual flow
2. post menstrual flow but still first half
3. second half but not premenstrual
4. three days premenstrual
5. (I do not have menstrual periods)

INSTRUCTIONS: Fill in your name, complete all sections, and return to me in class by 11:29 am. Ignore the blanks to the right of each rating scale, they are just for computer scoring

NAME _____ (Last) _____ (First)

April 3, 1985 Sequence: 2

Foods* Indicate on a scale of 1 to 7 how much you "crave" each of the following right now, at this very minute (circle one)

	None						Extreme	
1. Chicken or turkey - - -	1	2	3	4	5	6	7	
2. Vanilla ice cream - - -	1	2	3	4	5	6	7	
3. Ice cream - - - - - - -	1	2	3	4	5	6	7	
4. Hamburger - - - - - - -	1	2	3	4	5	6	7	
5. Chocolate candy bar - -	1	2	3	4	5	6	7	
6. Noodles or rice - - - -	1	2	3	4	5	6	7	
7. Candy bar - - - - - - -	1	2	3	4	5	6	7	
8. Alcoholic beverages - -	1	2	3	4	5	6	7	
9. Potato chips - - - - -	1	2	3	4	5	6	7	
10. Strawberry ice cream -	1	2	3	4	5	6	7	
11. Popcorn - - - - - - -	1	2	3	4	5	6	7	
12. Ham or bacon - - - - -	1	2	3	4	5	6	7	
13. Crackers - - - - - - -	1	2	3	4	5	6	7	
14. Chocolate ice cream - -	1	2	3	4	5	6	7	
15. Cookies - - - - - - -	1	2	3	4	5	6	7	
16. Donuts - - - - - - -	1	2	3	4	5	6	7	
17. Chocolate chip cookies	1	2	3	4	5	6	7	
18. Tea - - - - - - - - -	1	2	3	4	5	6	7	
19. Pizza - - - - - - - -	1	2	3	4	5	6	7	
20. Coffee - - - - - - -	1	2	3	4	5	6	7	
21. Tacos or nachos - - - -	1	2	3	4	5	6	7	
22. Hot dog - - - - - - -	1	2	3	4	5	6	7	
23. Peanut butter - - - -	1	2	3	4	5	6	7	
24. Bread or rolls - - - -	1	2	3	4	5	6	7	
25. Chocolate milk - - - -	1	2	3	4	5	6	7	
26. Chocolate cake - - - -	1	2	3	4	5	6	7	
27. Soft drinks - - - - - -	1	2	3	4	5	6	7	
28. Cake - - - - - - - -	1	2	3	4	5	6	7	
29. French fries - - - - -	1	2	3	4	5	6	7	
30. Pie - - - - - - - -	1	2	3	4	5	6	7	
31. Milk - - - - - - - -	1	2	3	4	5	6	7	
32. Cereal - - - - - - - -	1	2	3	4	5	6	7	

Symptoms* Indicate on a scale of 1 to 7 how much you are experiencing each of the following symptoms right now, at this very minute (circle one)

	None						Extreme	
33. Chest pains - - - - - - -	1	2	3	4	5	6	7	
34. Sharp cramps - - - - - - -	1	2	3	4	5	6	7	
35. Diarrhea or constipation - -	1	2	3	4	5	6	7	
36. Heart pounding - - - - - -	1	2	3	4	5	6	7	
37. Depression - - - - - - -	1	2	3	4	5	6	7	
38. General aching - - - - - -	1	2	3	4	5	6	7	
39. Tension (nervousness) - - -	1	2	3	4	5	6	7	
40. Numbness, tingling - - - - -	1	2	3	4	5	6	7	
41. Headache - - - - - - - -	1	2	3	4	5	6	7	
42. Backache - - - - - - - -	1	2	3	4	5	6	7	
43. Irritability - - - - - - -	1	2	3	4	5	6	7	
44. Feeling of suffocation - - -	1	2	3	4	5	6	7	
45. Ringing in the ears - - - -	1	2	3	4	5	6	7	
46. Stomach pain - - - - - - -	1	2	3	4	5	6	7	
47. Facial blemishes - - - - -	1	2	3	4	5	6	7	
48. Dull, aching cramps - - - -	1	2	3	4	5	6	7	
49. Weakness - - - - - - - -	1	2	3	4	5	6	7	
50. Soreness - - - - - - - -	1	2	3	4	5	6	7	
51. Nausea - - - - - - - -	1	2	3	4	5	6	7	
52. Blindspots, fuzzy vision - -	1	2	3	4	5	6	7	
53. Upset stomach - - - - - - -	1	2	3	4	5	6	7	
54. Feeling bloated - - - - - -	1	2	3	4	5	6	7	

Stress* Indicate on a scale of 1 to 7 how much stress you feel right now, at this very minute, due to each of the following.

	None						Extreme	
55. Schoolwork stress - - - - -	1	2	3	4	5	6	7	
56. Personal relationships (family) stress - - - - -	1	2	3	4	5	6	7	
57. Personal relationships (other than family) stress - - -	1	2	3	4	5	6	7	
58. Financial stress - - - - -	1	2	3	4	5	6	7	
59. Job stress(answer only if you have a job) - - - - - -	1	2	3	4	5	6	7	
60. Health problems - - - - - -	1	2	3	4	5	6	7	

61. Did you fill in your NAME? 1. yes 2. no

62. Compared to usual, how much total food did you eat during the last 24 hours?
1. Definitely less than usual
2. Somewhat less than usual
3. Usual
4. Somewhat more than usual
5. Definitely more than usual

63. Did you have breakfast this morning?
1. No, I didn't eat anything
2. Just coffee or tea
3. Yes, a little breakfast with food or beverage other than coffee or tea
4. Yes, a moderate-sized breakfast
5. Yes, a large breakfast

64. Are you on a special diet right now?
1. No
2. Yes, on a weight loss diet
3. Yes, special diet other than weight loss (Specify) _____

65. Have you experienced a cold or flu in the last 24 hours? 1. yes 2. no

66. Did you get seven hours or more of sleep last evening? 1. yes 2. no

67. Have you smoked a cigarette in the last 24 hours? 1. yes 2. no

WOMEN ONLY (Answer last 3 questions)

68. Did your period start within the last 24 hours? 1. yes 2. no

69. When was your last period? (month and date) _____

70. This question pertains to the stage of menstrual cycle that you are in right now. Consider your menstrual cycle as being broken down in to the first half, and the second half, with day 1 as the beginning of menstrual flow. During which of the following "stages" are you in right now?
1. menstrual flow
2. not menstrual flow but still first half
3. second half but not premenstrual
4. three days premenstrual
5. (I do not have menstrual periods)

INSTRUCTIONS: Fill in your student number, complete all sections and return to me in class by 11:29 am. Ignore the blanks to the right of each rating scale, they are just for computer scoring

NAME _____ TEST April 10, 1985 TYPE Sequence: A

Foods* Indicate on a scale of 1 to 7 how much you "crave" each of the following right now, at this very minute (circle one)

	None					Extreme	
1. Vanilla ice cream	1	2	3	4	5	6	7
2. Coffee	1	2	3	4	5	6	7
3. Hamburger	1	2	3	4	5	6	7
4. Chocolate ice cream	1	2	3	4	5	6	7
5. Alcoholic beverages	1	2	3	4	5	6	7
6. Cereal	1	2	3	4	5	6	7
7. Bread or rolls	1	2	3	4	5	6	7
8. Candy bar	1	2	3	4	5	6	7
9. Ham or bacon	1	2	3	4	5	6	7
10. Tacos or Nachos	1	2	3	4	5	6	7
11. Chocolate milk	1	2	3	4	5	6	7
12. Pizza	1	2	3	4	5	6	7
13. Chocolate cake	1	2	3	4	5	6	7
14. Chocolate chip cookies	1	2	3	4	5	6	7
15. Crackers	1	2	3	4	5	6	7
16. Strawberry ice cream	1	2	3	4	5	6	7
17. Tea	1	2	3	4	5	6	7
18. Chocolate candy bar	1	2	3	4	5	6	7
19. Milk	1	2	3	4	5	6	7
20. Popcorn	1	2	3	4	5	6	7
21. Cake	1	2	3	4	5	6	7
22. Peanut butter	1	2	3	4	5	6	7
23. Chicken or turkey	1	2	3	4	5	6	7
26. French fries	1	2	3	4	5	6	7
25. Potato chips	1	2	3	4	5	6	7
26. Ice cream	1	2	3	4	5	6	7
27. Cookies	1	2	3	4	5	6	7
28. Noodles or rice	1	2	3	4	5	6	7
29. Yogurt	1	2	3	4	5	6	7
30. Donuts	1	2	3	4	5	6	7
31. Pie	1	2	3	4	5	6	7
32. Soft drinks	1	2	3	4	5	6	7

Symptoms* Indicate on a scale of 1 to 7 how much you are experiencing each of the following symptoms right now, at this very minute (circle one)

	None					Extreme	
33. Upset stomach	1	2	3	4	5	6	7
34. Dull aching cramps	1	2	3	4	5	6	7
35. Depression	1	2	3	4	5	6	7
36. Stomach pain	1	2	3	4	5	6	7
37. Ringing in the ears	1	2	3	4	5	6	7
38. Numbness, tingling	1	2	3	4	5	6	7
39. Blindspots, fuzzy vision	1	2	3	4	5	6	7
40. Feeling bloated	1	2	3	4	5	6	7
41. Diarrhea or constipation	1	2	3	4	5	6	7
42. Tension (nervousness)	1	2	3	4	5	6	7
43. General aching	1	2	3	4	5	6	7
44. Sharp cramps	1	2	3	4	5	6	7
45. Headache	1	2	3	4	5	6	7
46. Backache	1	2	3	4	5	6	7
47. Nausea	1	2	3	4	5	6	7
48. Weakness	1	2	3	4	5	6	7
49. Soreness	1	2	3	4	5	6	7
50. Irritability	1	2	3	4	5	6	7
51. Heart pounding	1	2	3	4	5	6	7
52. Feeling of suffocation	1	2	3	4	5	6	7
53. Facial blemishes	1	2	3	4	5	6	7
54. Chest pains	1	2	3	4	5	6	7

Stress* Indicate on a scale of 1 to 7 how much stress you feel right now, at this very minute, due to each of the following.

	None					Extreme	
55. Schoolwork stress	1	2	3	4	5	6	7
56. Personal relationship (family) stress	1	2	3	4	5	6	7
57. Personal relationship (other than family) stress	1	2	3	4	5	6	7
58. Financial stress	1	2	3	4	5	6	7
59. Job stress (answer only if you have a job)	1	2	3	4	5	6	7
60. Health problems	1	2	3	4	5	6	7

61. Did you fill in your NAME? 1. yes 2. no

62. Compared to usual, how much total food did you eat during the last 24 hours?
1. Definitely less than usual
2. Somewhat less than usual
3. Usual
4. Somewhat more than usual
5. Definitely more than usual

63. Did you have breakfast this morning?
1. No, I didn't eat anything
2. Just coffee or tea
3. Yes, a little breakfast with food or beverage other than coffee or tea
4. Yes, a moderate-sized breakfast
5. Yes, a large breakfast

64. Are you on a special diet right now?
1. No
2. Yes, on a weight loss diet
3. Yes, special diet other than weight loss (Specify) _____

65. Have you experienced a cold or flu in the last 24 hours? 1. yes 2. no

66. Did you get seven hours or more of sleep last evening? 1. yes 2. no

67. Have you smoked a cigarette in the last 26 hours? 1. yes 2. no

WOMEN ONLY (Answer last 3 questions)

68. Did your period start within the last 24 hours? 1. yes 2. no

69. When was your last period? (month and date) _____

70. This question pertains to the stage of menstrual cycle that you are in right now. Consider your menstrual cycle as being broken down in to the first half, and the second half, with day 1 as the beginning of menstrual flow. During which of the following "stages" are you in right now?
1. menstrual flow
2. not menstrual flow but still first half
3. second half but not premenstrual
4. three days premenstrual
5. (I do not have menstrual periods)

NAME _____ Last _____ First

INSTRUCTIONS: Fill in your student number, complete all sections and return to me in class by 11:25 am. Ignore the blanks to the right of each rating scale, they are just for computer scoring

April 17, 1985 Sequence: C

Foods* Indicate on a scale of 1 to 7 how much you "crave" each of the following right now, at this very minute (circle one)

	None						Extreme	
1. Vanilla ice cream	1	2	3	4	5	6	7	___
2. Hamburger	1	2	3	4	5	6	7	___
3. Candy bar	1	2	3	4	5	6	7	___
4. Strawberry ice cream	1	2	3	4	5	6	7	___
5. Soft drinks	1	2	3	4	5	6	7	___
6. Bread or rolls	1	2	3	4	5	6	7	___
7. Tacos or Nachos	1	2	3	4	5	6	7	___
8. Chocolate ice cream	1	2	3	4	5	6	7	___
9. Ham or bacon	1	2	3	4	5	6	7	___
10. Alcoholic beverages	1	2	3	4	5	6	7	___
11. Noodles or rice	1	2	3	4	5	6	7	___
12. Potato chips	1	2	3	4	5	6	7	___
13. Cake	1	2	3	4	5	6	7	___
14. French fries	1	2	3	4	5	6	7	___
15. Chocolate milk	1	2	3	4	5	6	7	___
16. Milk	1	2	3	4	5	6	7	___
17. Chocolate candy	1	2	3	4	5	6	7	___
18. Chocolate cake	1	2	3	4	5	6	7	___
19. Tea	1	2	3	4	5	6	7	___
20. Cookies	1	2	3	4	5	6	7	___
21. Chicken or turkey	1	2	3	4	5	6	7	___
22. Ice cream	1	2	3	4	5	6	7	___
23. Crackers	1	2	3	4	5	6	7	___
24. Cereal	1	2	3	4	5	6	7	___
25. Peanut butter	1	2	3	4	5	6	7	___
26. Popcorn	1	2	3	4	5	6	7	___
27. Chocolate chip cookies	1	2	3	4	5	6	7	___
28. Coffee	1	2	3	4	5	6	7	___
29. Hot dog	1	2	3	4	5	6	7	___
30. Pizza	1	2	3	4	5	6	7	___
31. Donuts	1	2	3	4	5	6	7	___
32. Pie	1	2	3	4	5	6	7	___

Symptoms* Indicate on a scale of 1 to 7 how much you are experiencing each of the following symptoms right now, at this very minute (circle one)

	None						Extreme	
33. Upset stomach	1	2	3	4	5	6	7	___
34. Sharp cramps	1	2	3	4	5	6	7	___
35. Boredom	1	2	3	4	5	6	7	___
36. Irritability	1	2	3	4	5	6	7	___
37. Facial blemishes	1	2	3	4	5	6	7	___
38. Feelings of suffocation	1	2	3	4	5	6	7	___
39. Nausea	1	2	3	4	5	6	7	___
40. Heart pounding	1	2	3	4	5	6	7	___
41. Depression	1	2	3	4	5	6	7	___
42. General aching	1	2	3	4	5	6	7	___
43. Dull, aching cramps	1	2	3	4	5	6	7	___
44. Tension (nervousness)	1	2	3	4	5	6	7	___
45. Numbness, tingling	1	2	3	4	5	6	7	___
46. Ringing in the ears	1	2	3	4	5	6	7	___
47. Feeling bloated	1	2	3	4	5	6	7	___
48. Headache	1	2	3	4	5	6	7	___
49. Stomach pain	1	2	3	4	5	6	7	___
50. Diarrhea or constipation	1	2	3	4	5	6	7	___
51. Backache	1	2	3	4	5	6	7	___
52. Weakness	1	2	3	4	5	6	7	___
53. Blindspots, fuzzy vision	1	2	3	4	5	6	7	___
54. Chest pains	1	2	3	4	5	6	7	___

Stress* Indicate on a scale of 1 to 7 how much stress you feel right now, at this very minute, due to each of the following.

	None						Extreme	
55. Schoolwork stress	1	2	3	4	5	6	7	___
56. Personal relationship (family) stress	1	2	3	4	5	6	7	___
57. Personal relationship (other than family) stress	1	2	3	4	5	6	7	___
58. Financial stress	1	2	3	4	5	6	7	___
59. Job stress (answer only if you have a job)	1	2	3	4	5	6	7	___
60. Health problems	1	2	3	4	5	6	7	___

61. Did you fill in your NAME? 1. yes 2. no ___

62. Compared to usual, how much total food did you eat during the last 24 hours? ___
1. Definitely less than usual
2. Somewhat less than usual
3. Usual
4. Somewhat more than usual
5. Definitely more than usual

63. Did you have breakfast this morning? ___
1. No, I didn't eat anything
2. Just coffee or tea
3. Yes, a little breakfast with food or beverage other than coffee or tea
4. Yes, a moderate-sized breakfast
5. Yes, a large breakfast

64. Are you on a special diet right now? ___
1. No
2. Yes, on a weight loss diet
3. Yes, special diet other than weight loss (Specify)_____

65. Have you experienced a cold or flu in the last 24 hours? 1. yes 2. no ___

66. Did you get seven hours or more of sleep last evening? 1. yes 2. no ___

67. Have you smoked a cigarette in the last 24 hours? 1. yes 2. no ___

WOMEN ONLY (Answer last 3 questions)

68. Did your period start within the last 24 hours? 1. yes 2. no ___

69. When was your last period? (month and date)_____

70. This question pertains to the stage of menstrual cycle that you are in right now. Consider your menstrual cycle as being broken down in to the first half, and the second half, with day 1 as the beginning of menstrual flow. During which of the following "stages" are you in right now? ___
1. menstrual flow
2. not menstrual flow but still first half
3. second half but not premenstrual
4. three days premenstrual
5. (I do not have menstrual periods)

INSTRUCTIONS: Fill in your student number, complete all sections and return to me in class by 11:29 am. Ignore the blanks to the right of each rating scale, they are just for computer scoring

NAME _____ (Last) _____ (First)

April 24, 1985 Sequence: 5

Foods* Indicate on a scale of 1 to 7 how much you "crave" each of the following right now, at this very minute (circle one)

	None						Extreme	
1. Tacos or nachos	1	2	3	4	5	6	7	
2. Peanut butter	1	2	3	4	5	6	7	
3. Donuts	1	2	3	4	5	6	7	
4. Chicken or turkey	1	2	3	4	5	6	7	
5. Chocolate milk	1	2	3	4	5	6	7	
6. Alcoholic beverages	1	2	3	4	5	6	7	
7. Ham or bacon	1	2	3	4	5	6	7	
8. Pie	1	2	3	4	5	6	7	
9. Coffee	1	2	3	4	5	6	7	
10. Candy bar	1	2	3	4	5	6	7	
11. Ice cream	1	2	3	4	5	6	7	
12. Strawberry ice cream	1	2	3	4	5	6	7	
13. Milk	1	2	3	4	5	6	7	
14. Potato chips	1	2	3	4	5	6	7	
15. Crackers	1	2	3	4	5	6	7	
16. Chocolate candy bar	1	2	3	4	5	6	7	
17. Noodles or rice	1	2	3	4	5	6	7	
18. Chocolate chip cookies	1	2	3	4	5	6	7	
19. Hamburger	1	2	3	4	5	6	7	
20. Bread or rolls	1	2	3	4	5	6	7	
21. Pizza	1	2	3	4	5	6	7	
22. Tea	1	2	3	4	5	6	7	
23. Popcorn	1	2	3	4	5	6	7	
24. Vanilla ice cream	1	2	3	4	5	6	7	
25. Cake	1	2	3	4	5	6	7	
26. Soft drinks	1	2	3	4	5	6	7	
27. Cookies	1	2	3	4	5	6	7	
28. Chocolate ice cream	1	2	3	4	5	6	7	
29. Hot dog	1	2	3	4	5	6	7	
30. Chocolate cake	1	2	3	4	5	6	7	
31. Cereal	1	2	3	4	5	6	7	
32. French fries	1	2	3	4	5	6	7	

Symptoms* Indicate on a scale of 1 to 7 how much you are experiencing each of the following symptoms right now, at this very minute (circle one)

	None						Extreme	
33. Depression	1	2	3	4	5	6	7	
34. Nausea	1	2	3	4	5	6	7	
35. Feelings of suffocation	1	2	3	4	5	6	7	
36. Tension (nervousness)	1	2	3	4	5	6	7	
37. Sharp cramps	1	2	3	4	5	6	7	
38. Diarrhea or constipation	1	2	3	4	5	6	7	
39. Irritability	1	2	3	4	5	6	7	
40. Ringing in the ears	1	2	3	4	5	6	7	
41. Feeling bloated	1	2	3	4	5	6	7	
42. Numbness, tingling	1	2	3	4	5	6	7	
43. Facial blemishes	1	2	3	4	5	6	7	
44. Blind spots, fuzzy vision	1	2	3	4	5	6	7	
45. General aching	1	2	3	4	5	6	7	
46. Backache	1	2	3	4	5	6	7	
47. Weakness	1	2	3	4	5	6	7	
48. Heart pounding	1	2	3	4	5	6	7	
49. Dull, aching cramps	1	2	3	4	5	6	7	
50. Chest pains	1	2	3	4	5	6	7	
51. Headache	1	2	3	4	5	6	7	
52. Upset stomach	1	2	3	4	5	6	7	
53. Bored	1	2	3	4	5	6	7	
54. Stomach pain	1	2	3	4	5	6	7	

Stress* Indicate on a scale of 1 to 7 how much stress you feel right now, at this very minute, due to each of the following

	None						Extreme	
55. Schoolwork stress	1	2	3	4	5	6	7	
56. Personal relationship (family) stress	1	2	3	4	5	6	7	
57. Personal relationship (other than family) stress	1	2	3	4	5	6	7	
58. Financial stress	1	2	3	4	5	6	7	
59. Job stress (answer only if you have a job)	1	2	3	4	5	6	7	
60. Health problems	1	2	3	4	5	6	7	

61. Did you fill in your NAME? 1. yes 2. no

62. Compared to usual, how much total food did you eat during the last 24 hours?
1. Definitely less than usual
2. Somewhat less than usual
3. Usual
4. Somewhat more than usual
5. Definitely more than usual

63. Did you have breakfast this morning?
1. No, I didn't eat anything
2. Just coffee or tea
3. Yes, a little breakfast with food or beverage other than coffee or tea
4. Yes, a moderate-sized breakfast
5. Yes, a large breakfast

64. Are you on a special diet right now?
1. No
2. Yes, on a weight loss diet
3. Yes, special diet other than weight loss (Specify) _____

65. Have you experienced a cold or flu in the last 24 hours? 1. yes 2. no

66. Did you get seven hours or more of sleep last evening? 1. yes 2. no

67. Have you smoked a cigarette in the last 24 hours? 1. yes 2. no

WOMEN ONLY (Answer last 3 questions)

68. Did your period start within the last 24 hours? 1. yes 2. no

69. When was your last period? (month and date) _____

70. This question pertains to the stage of menstrual cycle that you are in right now. Consider your menstrual cycle as being broken down in to the first half, and the second half, with day 1 as the beginning of menstrual flow. During which of the following "stages" are you in right now?
1. menstrual flow
2. not menstrual flow but still first half
3. second half but not premenstrual
4. three days premenstrual
5. (I do not have menstrual periods)

INSTRUCTIONS: Fill in your student number, complete all sections and return to me in class by 11:29 am. Ignore the blanks to the right of each rating scale, they are just for computer scoring

NAME: _____ (last) _____ (first)

May 1, 1985 Sequence: 4

Foods* Indicate on a scale of 1 to 7 how much you "crave" each of the following right now, at this very minute (circle one)

	None					Extreme	
1. Vanilla ice cream	1	2	3	4	5	6	7
2. Potato chips	1	2	3	4	5	6	7
3. Pizza	1	2	3	4	5	6	7
4. Tea	1	2	3	4	5	6	7
5. Crackers	1	2	3	4	5	6	7
6. Cookies	1	2	3	4	5	6	7
7. Chicken or turkey	1	2	3	4	5	6	7
8. Chocolate candy bar	1	2	3	4	5	6	7
9. Alcoholic beverages	1	2	3	4	5	6	7
10. Milk	1	2	3	4	5	6	7
11. Bread or rolls	1	2	3	4	5	6	7
12. Hamburger	1	2	3	4	5	6	7
13. Strawberry ice cream	1	2	3	4	5	6	7
14. Tacos or Nachos	1	2	3	4	5	6	7
15. Ham or bacon	1	2	3	4	5	6	7
16. Chocolate chip cookies	1	2	3	4	5	6	7
17. Hot dog	1	2	3	4	5	6	7
18. Cereal	1	2	3	4	5	6	7
19. Coffee	1	2	3	4	5	6	7
20. Noodles or rice	1	2	3	4	5	6	7
21. Pie	1	2	3	4	5	6	7
22. Chocolate ice cream	1	2	3	4	5	6	7
23. Donuts	1	2	3	4	5	6	7
24. Peanut butter	1	2	3	4	5	6	7
25. Cake	1	2	3	4	5	6	7
26. French Fries	1	2	3	4	5	6	7
27. Chocolate cake	1	2	3	4	5	6	7
28. Chocolate milk	1	2	3	4	5	6	7
29. Popcorn	1	2	3	4	5	6	7
30. Ice cream	1	2	3	4	5	6	7
31. Soft drinks	1	2	3	4	5	6	7
32. Candy bar	1	2	3	4	5	6	7

Symptoms* Indicate on a scale of 1 to 7 how much you are experiencing each of the following symptoms right now, at this very minute (circle one)

	None					Extreme	
33. Headache	1	2	3	4	5	6	7
34. General aching	1	2	3	4	5	6	7
35. Numbness, tingling	1	2	3	4	5	6	7
36. Feeling of suffocation	1	2	3	4	5	6	7
37. Depression	1	2	3	4	5	6	7
38. Nausea	1	2	3	4	5	6	7
39. Diarrhea or constipation	1	2	3	4	5	6	7
40. Backache	1	2	3	4	5	6	7
41. Stomach pain	1	2	3	4	5	6	7
42. Ringing in the ears	1	2	3	4	5	6	7
43. Chest pains	1	2	3	4	5	6	7
44. Tension (nervousness)	1	2	3	4	5	6	7
45. Facial blemishes	1	2	3	4	5	6	7
46. Boredom	1	2	3	4	5	6	7
47. Dull, aching cramps	1	2	3	4	5	6	7
48. Heart pounding	1	2	3	4	5	6	7
49. Blind spots, fuzzy vision	1	2	3	4	5	6	7
50. Weakness	1	2	3	4	5	6	7
51. Irritability	1	2	3	4	5	6	7
52. Upset stomach	1	2	3	4	5	6	7
53. Sharp cramps	1	2	3	4	5	6	7
54. Feeling bloated	1	2	3	4	5	6	7

Stress* Indicate on a scale of 1 to 7 how much stress you feel right now, at this very minute, due to each of the following.

	None					Extreme	
55. Schoolwork stress	1	2	3	4	5	6	7
56. Personal relationship (family) stress	1	2	3	4	5	6	7
57. Personal relationship (other than family) stress	1	2	3	4	5	6	7
58. Financial stress	1	2	3	4	5	6	7
59. Job stress(answer only if you have a job)	1	2	3	4	5	6	7
60. Health problems	1	2	3	4	5	6	7

61. Did you fill in your NAME? 1. yes 2. no

62. Compared to usual, how much total food did you eat during the last 24 hours?
1. Definitely less than usual
2. Somewhat less than usual
3. Usual
4. Somewhat more than usual
5. Definitely more than usual

63. Did you have breakfast this morning?
1. No, I didn't eat anything
2. Just coffee or tea
3. Yes, a little breakfast with food or beverage other than coffee or tea
4. Yes, a moderate-sized breakfast
5. Yes, a large breakfast

64. Are you on a special diet right now?
1. No
2. Yes, on a weight loss diet
3. Yes, special diet other than weight loss (Specify) _____

65. Have you experienced a cold or flu in the last 24 hours? 1. yes 2. no

66. Did you get seven hours or more of sleep last evening? 1. yes 2. no

67. Have you smoked a cigarette in the last 24 hours? 1. yes 2. no

WOMEN ONLY (Answer last 3 questions)

68. Did your period start within the last 24 hours? 1. yes 2. no

69. When was your last period? (month and date) _____

70. This question pertains to the stage of menstrual cycle that you are in right now. Consider your menstrual cycle as being broken down in to the first half, and the second half, with day 1 as the beginning of menstrual flow. During which of the following "stages" are you in right now?
1. menstrual flow
2. not menstrual flow but still first half
3. second half but not premenstrual
4. three days premenstrual
5. (I do not have menstrual periods)

Appendix Table 3

College of Home Economics

APPLICATION FOR APPROVAL TO USE HUMAN SUBJECTS

1. ACTIVITY OR PROJECT TITLE: Premenstrual craving for chocolate in women

2. PROPOSED SPONSOR (IF ANY): Chocolate Manufacturer's Association

3. Katharine K. Grunewald, Ph.D., R.D. (applicant must be faculty member) — NAME
Foods and Nutrition — DEPARTMENT
(913) 532-5508 — PHONE

4. RISK

A. Are there risks to human subjects? _____yes __X__no

If yes, briefly describe. (See definition of risk, page 2 of the Handbook.)

B. Describe the benefits of the research

a) to the subjects:
Subjects will be students in my Basic Nutrition class (FN 132) here at Kansas State University. At the end of the study the students can discover how stage of menstrual cycle and symptoms associated with the premenstrual phase affect their eating habits. Makes the study

b) to the discipline/profession: of nutrition more personal to them.

Examines effects of menstrual cycle on craving for specific components such as chocolate, sugar, carbohydrates, and total food intake.

5. INFORMED CONSENT: General informed consent requirements are described on pages 3 and 4 of the Handbook. The written informed consent document must include the following: (1) a fair explanation of procedures to be followed, (2) description of discomforts and risks, (3) description of benefits, (4) disclosure of appropriate alternatives available, if an offer to answer inquiries, and (6) instructions that the subject is free to withdraw consent and participation at any time. Special informed consent policies relative to questionnaire/survey studies are described in the "Handbook Supplement" dated July, 1977.

On what page(s) of the proposal are your informed consent procedure and/or forms described? (If not a part of your proposal, the procedures and informed consent document must accompany this application.)

(OVER)

6. EMERGENCIES

A. Are any possible emergencies anticipated? _____yes _X_no
If yes, describe briefly or give the page of the proposal where these are described.

B. Describe procedures for dealing with emergencies, or give the page of the proposal on which these descriptions may be found.

7. PRIVACY: On what page of the proposal do you discuss procedures for keeping research data private? _____ This should include procedures for maintaining anonymity of subjects. Supplemental information concerning privacy of data may be discussed below. (See page 3 of the Handbook on "Safeguarding Information.")

8. STATEMENT OF AGREEMENT: The below named individual certifies that he/she has read and is willing to conduct these activities in accordance with the Handbook for Research, Development, Demonstration, or Other Activities Involving Human Subjects. Further, the below named individual certifies that any changes in procedures from those outlined above or in the attached proposal will be cleared through Committee 8290, The Committee on Research Involving Human Subjects via the College of Home Economics Subcommittee.

Signed [signature] (Applicant) Date December 6, 1984

Send applications to:

Appendix Table 4

KSU
KANSAS STATE UNIVERSITY

Graduate School

Fairchild Hall
Manhattan, Kansas 66506
913-532-6181

TO: Dr. Katharine Grunewald — Proposal Number: 450
Foods and Nutrition
Justin Hall

FROM: Robert P. Lowman, Chair
Committee on Research Involving Human Subjects

DATE: December 6, 1984

RE: Committee Review of Your Proposal Titled Premenstrual Craving for Chocolate in Women

The Committee on Research Involving Human Subjects has received your proposal. Under current federal regulations, the Chair of the Committee is authorized to exempt from review certain specified categories of research.

After careful examination, the Chair has determined that your proposal is exempt from review under the provisions of federal regulations listed below.

This exemption applies to this project only under the conditions and procedures described in your application. Any change in the protocol or conditions described in the proposal may disqualify the project for exemption.

Exemption from federal regulations does not release the investigator from responsibility for obtaining informed consent of subjects. Prior to involving any human subjects, written or oral informed consent must be obtained from each subject or an authorized representative. If the informed consent is written, the signed forms must be retained on file for a minimum of three years after termination of the project. Individual identification of human subjects in any publication is an "invasion of privacy" and requires a separately executed "informed consent." Each research subject must be furnished with a copy of the informed consent statement for his or her personal records, whether consent was obtained orally or in written form.

Any unanticipated problems involving risk to human subjects or others should be reported immediately to the Director of the Student Health Center and the Chairperson of the Committee on Research Involving Human Subjects.

Legal basis for exemption: paragraph #3, use of questionnaire

Appendix Table 5. Usual consumption of foods by 83 young college women and 21 young college men based on food intake two months prior to the study*

Food	Women (no.=83)	Men (no.=21)
Chocolate foods		
Chocolate cake	6.18 ± 0.78	6.52 ± 0.59#
Chocolate candy bar	5.57 ± 1.16	5.86 ± 1.25#
Chocolate milk	6.57 ± 0.91	5.71 ± 1.35#
Chocolate chip cookies	6.07 ± 0.95	5.96 ± 0.65
Chocolate ice cream	6.33 ± 0.73	6.67 ± 0.57#
Non-chocolate controls		
Cake (any type)	5.95 ± 0.89	6.10 ± 0.92
Candy bar (any type)	5.58 ± 1.14	5.62 ± 1.40
Milk (any type)	5.90 ± 1.78	2.67 ± 1.76#
Cookies (any type)	5.39 ± 1.16	5.33 ± 1.59
Ice cream (any type)	5.65 ± 0.81	5.81 ± 1.10
High sugar foods		
Cake (any type)	5.95 ± 0.84	6.10 ± 0.92
Candy bar (any type)	5.58 ± 1.14	5.62 ± 1.40
Donuts	6.40 ± 0.82	5.71 ± 1.16#
Cookies (any type)	5.39 ± 1.16	5.33 ± 1.59
Ice cream (any type)	5.65 ± 0.81	5.81 ± 1.10
Pie	6.59 ± 0.60	6.38 ± 0.65#
Soft drinks	3.16 ± 1.42	3.81 ± 1.74#
High starch foods		
Popcorn	5.57 ± 1.07	6.14 ± 0.71#
Cereal	5.12 ± 1.60	4.33 ± 1.40#
Potato chips	5.27 ± 1.30	4.86 ± 1.25#
Rice or noodles	5.18 ± 1.16	5.10 ± 1.16
Bread and rolls	5.33 ± 1.46	2.81 ± 1.51#
French fries	5.45 ± 0.95	5.10 ± 1.42#
Crackers	4.90 ± 1.42	5.67 ± 0.95#
Lower carbohydrate foods		
Hamburger	5.16 ± 0.99	4.67 ± 1.21#
Peanut butter	5.63 ± 1.34	5.33 ± 1.33#
Pizza	5.54 ± 0.75	5.24 ± 0.92#
Hot dog	6.54 ± 0.83	6.19 ± 0.96#
Tacos or nachos	5.69 ± 0.88	5.95 ± 0.58
Chicken or turkey	5.06 ± 1.00	4.95 ± 0.90
Ham or bacon	5.73 ± 1.05	4.76 ± 1.02#
Other foods		
Alcoholic beverages	5.16 ± 1.08	5.24 ± 1.11
Strawberry ice cream	6.69 ± 0.31	6.86 ± 0.35
Vanilla ice cream	6.18 ± 0.79	6.05 ± 1.00
Coffee	6.23 ± 1.49	6.38 ± 1.30
Tea	4.61 ± 2.12	4.57 ± 1.90

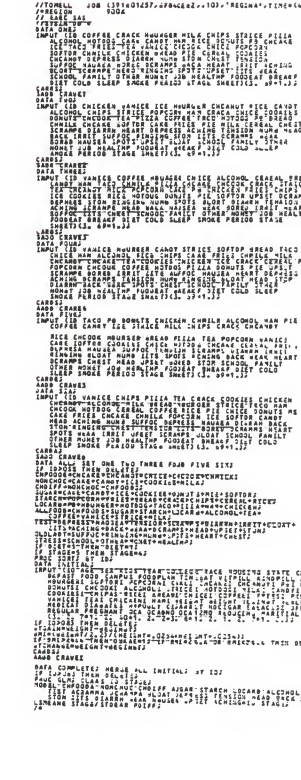
*Mean ± standard deviation. Numbers stand for the following: 1= 3X a day or more, 2= twice a day, 3= once a day, 4= several times a week, 5= once a week, 6= less than once a week, and 7= rarely if ever.
#Men differ significantly from women (α<0.05) using the Student's t test.

Appendix Table 6. Craving scores of individual foods within each group for 83 young college women and 21 young college men*

Food	Women (no.=456)	Men (no.=126)
Chocolate foods		
Chocolate cake	1.67 ± 1.36	1.96 ± 1.71#
Chocolate candy bar	1.67 ± 1.43	1.90 ± 1.62
Chocolate milk	1.53 ± 1.17	2.12 ± 1.81
Chocolate chip cookies	2.02 ± 1.57	2.31 ± 1.94
Chocolate ice cream	1.83 ± 1.45	1.62 ± 1.27
Non-chocolate controls		
Cake (any type)	1.48 ± 1.11	1.65 ± 1.61#
Candy bar (any type)	1.76 ± 1.27	1.96 ± 1.60
Milk (any type)	1.79 ± 1.41	2.79 ± 2.06#
Cookies (any type)	1.77 ± 1.37	2.03 ± 1.73
Ice cream (any type)	2.08 ± 1.62	1.87 ± 1.41
High sugar foods		
Cake (any type)	1.46 ± 1.11	1.65 ± 1.61
Candy bar (any type)	1.76 ± 1.27	1.96 ± 1.60
Pie	1.49 ± 1.06	2.10 ± 1.75#
Cookies (any type)	1.77 ± 1.37	2.03 ± 1.73
Ice cream (any type)	2.08 ± 1.62	1.87 ± 1.41
Donuts	1.93 ± 1.51	2.31 ± 1.84#
Soft drinks	3.75 ± 2.21	2.66 ± 1.90#
High starch foods		
Popcorn	1.74 ± 1.41	1.50 ± 1.05
Cereal	1.50 ± 1.22	1.73 ± 1.29
Potato chips	1.98 ± 1.50	1.86 ± 1.33
Rice and noodles	1.46 ± 1.10	1.73 ± 1.22#
Bread and rolls	1.75 ± 1.30	2.01 ± 1.47
French fries	2.43 ± 1.78	2.44 ± 1.57
Crackers	1.57 ± 1.15	1.27 ± 0.77#
Lower carbohydrate foods		
Hamburger	1.96 ± 1.44	2.20 ± 1.67
Peanut butter	1.53 ± 1.14	1.54 ± 1.09
Pizza	2.75 ± 1.92	2.41 ± 1.88
Hot dog	1.62 ± 1.27	1.67 ± 1.32
Tacos or nachos	2.37 ± 1.80	2.13 ± 1.65
Chicken or turkey	1.91 ± 1.48	2.33 ± 1.86#
Ham or bacon	1.60 ± 1.12	2.43 ± 1.95#
Other foods		
Alcoholic beverages	1.59 ± 1.31	1.66 ± 1.43
Strawberry ice cream	1.52 ± 1.17	1.59 ± 1.15
Vanilla ice cream	1.66 ± 1.27	1.83 ± 1.32
Coffee	1.31 ± 1.01	1.41 ± 1.04
Tea	2.24 ± 1.90	2.26 ± 1.60

*Mean ± standard deviation. Score indicates intensity of response for each variable tested on a scale of one to seven with the high score indicating a greater intensity. All variables were tested in each subject on six consecutive Wednesdays.
#Men differ significantly from women ($p<0.05$) using Student's t test.

Appendix Table 7



Appendix Table 8

```
DATA PARTIAL; SET ALL;
  BASELINE=MEAN(OF DEPRESS DIARRH NUMB STOM CHEST
  TENSION SUFFOC NAUSEA BORED OCRAMPS BACK HEART IRRIT
  ACHING BLOAT SCRAMPS HEAD RINGING SPOTS UPSET ZITS
  WEAK SCHOOL FAMILY OTHER MONEY JOB HEALTHP FOODEAT
  BREAKF DIET COLD SLEEP SMOKE PERIOD ALCOHOL CHFOODS
  NONCHOC CHOIFF SUGAR STARCH LOCARB ALLFOOD TEST
  OLDLADY STRESS);
  ARRAY XX DEPRESS DIARRH NUMB STOM CHEST
  TENSION SUFFOC NAUSEA BORED OCRAMPS BACK HEART IRRIT
  ACHING BLOAT SCRAMPS HEAD RINGING SPOTS UPSET ZITS
  WEAK SCHOOL FAMILY OTHER MONEY JOB HEALTHP FOODEAT
  BREAKF DIET COLD SLEEP SMOKE PERIOD ALCOHOL CHFOODS
  NONCHOC CHOIFF SUGAR STARCH LOCARB ALLFOOD TEST
  OLDLADY STRESS;
  DO OVER XX;
  XX=XX-BASELINE;
  END;

PROC CORR; VAR DEPRESS DIARRH NUMB STOM CHEST TENSION
  SUFFOC NAUSEA BORED OCRAMPS BACK HEART IRRIT ACHING
  BLOAT SCRAMPS HEAD RINGING SPOTS UPSET ZITS WEAK
  SCHOOL FAMILY OTHER MONEY JOB HEALTHP FOODEAT BREAKF
  DIET COLD SLEEP SMOKE PERIOD ALCOHOL CHFOODS NONCHOC CHOIFF
  SUGAR STARCH LOCARB ALLFOOD TEST OLDLADY STRESS;
```

Appendix Table 9

```
//TOMWELL  JOB (3R5490123F,6F8W&E82,,R),'REGINA',TIME=(1,59)
/*REGION          900K
// EXEC SAS
//SYSIN DD *
DATA CHEF;
INPUT IIR COFFEE CEACE MMURGER MILK CHIPS STRICK PIZZA
    ALCOHOL POTATO CAKE CANDY HAM RICE DESSERT PB CRACK
    ICE TACO APPLE TEA CHEESE CHICKEN CHEESE POPCORN
    SICK FRIES CEREAL MILKSHAKE CHEESE CHEESE CHEESE
    SHRIMP HOTDOG BISCUIT MUSH SLOW CHEST TOASTER
    WATER SAUCER BORED SCRAMPS BACK HEART HAT SCREW
    BLOAT SCRAMPS HEAD RINGING SPOTS SPOT LITE HEAD
    SCHOOL FAMILY STEAK MONEY JOB HEALTHP PODIATRY BREAST
    SHORT COLD SLEEP SMOKE PERIOD STAGE SWEET(3., 8P*1.)J
CARD1;
SAME CRAVE1
DATA TWO1
INPUT IIR CHICKEN YANICE JOB MMURGER CHEAMNT RICE CANDY
    ALCOHOL CHIPS RICE POPCORN HAM CEACE CHEESE COOKIES
    DONUTS CRCOUS TEA PIZZA COFFEE FACE HOTDOG HEADACHE
    CHEAMNT CHEESE TEA COOKIES CHICKEN ICE CRACK CEREAL CHEST
    SCRAMPS STOMACH HEART DEPRESS SICKNESS TERRIOR NUMB HEAD
    BACK IRAIL SUPPOSE KIDNEYS JOB LITE SCRAMPS HEAD
    BREED RAMSHA HOTEL UPSET ALSAT SCHOOL FAMILY
    MONEY JOB HEALTHP PODIATRY BREAST SHORT COLD SLEEP
    SMOKE PERIOD STAGE SWEET(3., 8P*1.)J
CARD1;
SAME CRAVE1
DATA THREE1
INPUT IIR YANICE COFFEE MMURGER CRICE ALCOHOL CEREAL HEAD
    CRAMT HAM TACO CHOOLE PIZZA CHEESE CHCOOK CAKE STRICK
    TEA CHEAMNT MILK POPCORN CAKE PB CHICKEN PRICE CHIPS
    ICE CRACKERS MILK HOTDOG PB CHIPS ICE STRICK SCRAMPS
    APPLE BREAD TEA CHEESE HAMBURGER MILK CHEESE MUSHROOM
    SCRAMPS SCRAMPS HEAD BACK IRAIL SLEEP CHEST HEART
    BUFFER LITE CHEST SCHOOL FAMILY STEAK MONEY JOB HEALTHP
    PODIATRY BREAST SICK COLD SLEEP SMOKE PERIOD STAGE
    SWEET(3., 8P*1.)J
CARD1;
SAME CRAVE1
DATA FOUR1
INPUT IIR YANICE MMURGER CANDY STRICK SOFTBR BREAD TACO
    CHEESE HAM ALCOHOL MILK CHIPS CAKE PRICE CHEESE MILK
    CHEAMNT CHCAKE TEA COOKIES CHICKEN ICE CRACK CEREAL PB
    POPCORN CHEESE COFFEE HOTDOG PIZZA DONUTS CAKE STRICK
    SCRAMPS BOARD SWEET GIFT SUPPOSE NAUSEA HEART DEPRESS
    SCRAMPS HEAD BACK IRAIL SUPPOSE KIDNEYS JOB LITE STOM
    BEARDM NECK HEAD SPOTS CHEST SCHOOL FAMILY
    MONEY JOB HEALTHP PODIATRY BREAST SHORT COLD SLEEP
    SMOKE PERIOD STAGE SWEET(3., 8P*1.)J
CARD1;
SAME CRAVE1
DATA FIVE1
INPUT IIR
    CHEESE TACO PB DEALTH CHICKEN CAMILK ALCOHOL HAM PIE
    COFFEE CANDY ICE STRICK MILK CHIPS CAKE CHEESE CHEAMNT

    RICE CHCOOKE MMURGER BREAD MEZZA TBS POPCORN YANICE
    CAKE SOFTBR COOKIES CHICKEN HYPOG CHEAMNT CEREAL SWEET
    BREEDER MAILS SUPPOSE CHEST HEADACHE SCRAMPS HEAD
    STRIKING BLOAT NUMB LITE SPOTS CHIPS BACK HEART BLOAT
    SCRAMPS CHEST HEAD UPSET WOKER STOM SCHOOL FAMILY
    STEAK MONEY JOB HEALTHP PODIAT BREAST SHORT COLD
    SLEEP SMOKE PERIOD STAGE SWEET(3., 8P*1.)J
CARD1;
SAME CRAVE1
DATA SIX1
INPUT IIR
    YANICE CHIPS MEZZA TBS CEACE COOKIES CHICKEN
    CHEAMNT ALCOHOL MILK BREAD RIVERAM STRICK ADD HAM
    CAKE PB BLOOD FACE COLOR PB RICE CHIPS CHEESE PB
    CAKE CHEESE CHCAKE CHEESE CHEESE BUTTER CANOT
    HEAR ACHING SUPPOSE KIDNEYS JOB LITE SCRAMPS BOAT
    STOM KIMKINS CHEST FAMILY LITE SORES SCRAMPS HEART
    SPOTS HEAD IRAIL UPSET SCRAMPS BLOAT SCHOOL FAMILY
    STEAK MONEY JOB HEALTHP PODIAT BREAST SHORT COLD
    SLEEP SMOKE PERIOD STAGE SWEET(3., 8P*1.)J
CARD1;
SAME CRAVE1
DATA ALL1; SET ONE TWO THREE FOUR FIVE SIX;
IF IAGE1 THEN CHLD1=1;
CRFOOD1=(MCHEACE+CREAMAT+MCHICE+MCOOKE+CMMILK);
MOMEDC=MCHAGE+CANDT+(CPCOOKIES*MILK);
CHOIPP=MBEACOE+CHFOOD1;
CHEAMNT=(MCHEACE+CHEESE+MONUTS*MPIE*SOFTBR)
STACK=MPPCEAM+PIES+CHEESE+CREACH*SPICES+BREAD+MILK;
LOCARM=MP*MMURGER+RETMOPTACO*MILK+MHAMCHEESE;
ALLFOOD=CMFOOD1+MMURGER+CHEESE+MCAKE+ALCOHOL+TEA*
    (COFFEE*YANICE+TRICE*MILK);
TEST=MPPRESS*MAKE+(TRICE*MILK*SCRAMP*STACK8+TRITMALOAT+
    LITS*MCHING+BACK*MEANMORCRAMPS+BADHUPSETHIONS)
OLD=(MCHEACE+CREAMAT+MCHICE+MCOOKE+CMMILK)*HEART*CHEST;
STRESS=(MCHOL*LOSEFOOD+MONEY*HEALTHP)
IF STAGE1 THEN OTEE1=1;
IF STAGE2 THEN ITAE1=2;
IF STAGE3 OR STAGE4 THEN STAGE1=3;
PROC SORT; BY ID;
DATA INITIAL;
SET ALL1; BY ID; KEEP CEA CLOS YEAR CO-LIKE BACK MOVING STATE CHOOSES
    BREAST FOOD CAMPUS HOSPITAL THREAT CLIPPING CAPITAL RELIGION
    MMURGER; SOFTBR PEPCORN; CHEST CHCAKE; CHEAMNT; POT CAMILK; MILK;
    DONUTS; CRCOOKE; ALCOHOL; STRICK; HOTDOG; MILK; CANDY; CEREAL; TACO;
    COOKIES; CRIPS; RICE; BREAD; CHICKEN; COFFEE; TREAT; PIE; ICE; CANCE
    YANICE; TEA; CHECKING; RAM; ABOUT; BRIDGE; TEACH; HEALTH; ILLness
    MEDICAL DISASTER; HYPOG; CLEANED; HOE; BAR; BEREAVE; AFTER
    CHEAMNT; CHEESE; TEA; CHEESE; CHEESE; CHEESE; CHEESE; CHEESE; CYCLE);
    IF IAGE1 THEN CHLD1=1;
IF IAGE2 THEN CHL2=2;
STEAK=MPPRESS*(MCHEACE+CREAMAT+MCHICE+MCOOKE+CMMILK)
OMC=(CREAMAT*CHEESE)/(MCHEACE+.025*MCHEACE+.025*MCHEACE);
IF OMC=0.4 OR OMC=2.4 THEN OMEEE=2;
STEAK8=BEREAMAT*BREAMAT;
CARD2;

SAME CRAMPS1
DATA ALL2; SET; MERGE ALL (INITIAL) BY ID;
IF IAGE3 THEN DELETE;
PROC STEPWISE DATA=ALL;
MODEL CHFOOD3 MOMCHOI CHRIFF SUGAR STOACH LOCARM
    ALCOHOL=ALLFOOD TEST SCRAMPS SCRAMPS ALSAT DEPRESS TENSION
    READ RACE IRAIL STOM LITS DISEASE WEAK NAUSEA UPSET
    ACMINW/INCLUDE=4 SB
/*
```

Appendix Table 10

```
//TOMELL   JOB (SY1&Q1257,GP04CE&2,,,9),'REGINA',TIME=(1,59)
/*ROUTE    PRINT
// EXEC SAS
//SYSIN DD *
DATA ONE;
INPUT EGG CHEESE CRACK BURGER MILK CHIPS STEAK PIZZA
   ALCOHOL HOTDOG CAKE CANDY HAM RICE DONUTS PB CHEESE
   ICE TACO FRIES TEA VANILLA CHICKEN CHIPS POPCORN
   SOFTDR CHILI CHICKEN #BEAN PIE CEREAL COOKIES
   CHEWY DIPPERS DIARRH NURS STOM CHEST ANKLES
   SUPPOC HAUSEA BOREDM SCRAMPS BAKE HEART LAKES SCHING
   TROUBL TRAUMAT STEAK BOREDM PB&J SCHOOL FAMILY BREAKF
   DIET COLD SLEEP SMOKE PERIOD STAGE SMEETIL, $PW1.,J
CARDS4;
%INC CHEVET
DATA TWO;
INPUT EGG CHEESE# VANILL ICE #BURGER CHEANDY RICE CANDY
   CHEESE# CHIPS STAPLE POPCORN CHEESE# CHIPS CHEESE#
   DONUTS "COOK "BA "PIZZA COFFEE TACO SOFDRS PB CHEESE
   CHILE CHEESE SOFTDR CAKE FRIES PIE MILK CEREAL CHEST
   SCRAMPS DIARRH HEART DEPRESS ACHING TENSION NURS HEAD
   BACK TRAI SUPPOC STRESS TUM TASTE SCRAMPS "NO"
   BOREDM ADDICT BLOAT "BLOAT "BLOAT FAMILY SLEEP
   MONEY ADDICT HEALTHY "FOODFAT BREAKF DIET COLD SLEEP
   SMOKE PERIOD STAGE SMEETIL, $PW1.,J
CARDS;
%INC CHEVET
DATA THREE;
INPUT EGG VANILLA COFFEE #BURGER CHICE ALCOHOL CEREAL #BEAD
   CHEESE# CHIPS STAPLE POPCORN CHEESE# CHIPS CHEESE#
   TEA "CRANB" NICE "POTCHIPS CHEESE# CHIPS PIES "BUR
   ICE COOKIES NICE #OTDOG DONUTS PIE SOFTDR CAKE CRAMPS
   DEPRESS ITCH RINGING NURM WHITE BLOAT PISSY TENSION
   ACHING SCRAMPS HEAD BACK #AUSEA BRAA SCARED SWEET HEART
   SUSPOC LITS CHEST "FOODS FAMILY "OTHER MONEY JOB HEALTHY
   FOREST BREAKF DIET COLD SLEEP SMOKE PERIOD STAGE
   SMEETIL, $PW1.,J
CARDS;
%INC CHEVET
DATA FOUR;
INPUT EGG VANILLA #BURGER CANDY STACEE SOFTDR BREAD TALO
   CHEESE# CHIPS CHEESE# CHIPS CAKE PIES CHEESE# CHIPS
   POPCORN CHEESE# CHIPS CHEESE# CHIPS CEREAL CEREAL PB
   ICE COOKIES NICE #OTDOG DONUTS PIE SOFTDR CAKE CRAMPS
   SCRAMPS BOREDM FEMALE TUM SUPPOC #AUSEA #BAKE HEART
   ACHING SCRAMPS TENSION NURM #BACKNE BLOAT MEAD STOM
   DIARRH "BACK "BEA "POTS "CHEST SCHOOL FAMILY SLEEP
   MONAT JOB HEALTHY FOODFAT BREAKF DIET COLD SLEEP
   SMOKE PERIOD STAGE SMEETIL, $PW1.,J
CARDS4;
%INC CHAVE4
DATA FIVE;
INPUT EGG VANILLA CHIPS PIZZA TEA CRACK COOKIES CHICKEN
   CHCANDY AGESOMEM MILK BREAD BURGER STATES TACO #AM
   CHCOOK HOTDOG CEREAL COFFEE RICE PIE CAKE DONUTS PB
   CAKE PATES CHCAKE CHILE #CHEEN ICE SOFTDR CANDY
   CHEESE# CHIPS CHEESE# CHIPS CAKE PIES CHEESE# CHIPS
   STOM-TIMELOW "TIRE "TENSION TIRED HOUSE SCRAMPS HEART
   SPOTS #AKE IRRIT UPSET SCRAMPS BLOAT SCHOOL FAMILY
   OTHER MONEY JOB HEALTHY FOODFAT BREAKF DIET COLD
   SLEEP SMOKE PERIOD STAGE SMEETIL, $PW1.,J
CARDS4;
%INC CHAVE4
DATA SIX;
INPUT EGG VANILLA CHIPS PIZZA TEA CRACK COOKIES CHICKEN
   CHCANDY AGESOMEM MILK BREAD BURGER STATES TACO #AM
   CHCOOK HOTDOG CEREAL COFFEE RICE PIE CAKE DONUTS PB
   CAKE PATES CHCAKE CHILE #CHEEN ICE SOFTDR CANDY
   CHEESE# CHIPS CHEESE# CHIPS CAKE PIES CHEESE# CHIPS
   STOM-TIMELOW "TIRE "TENSION TIRED HOUSE SCRAMPS HEART
   SPOTS #AKE IRRIT UPSET SCRAMPS BLOAT SCHOOL FAMILY
   OTHER MONEY JOB HEALTHY FOODFAT BREAKF DIET COLD
   SLEEP SMOKE PERIOD STAGE SMEETIL, $PW1.,J
CARDS4;
%INC CHAVE4
DATA SEVEN;
IF CROSS1 THEN DELETE;
CHFOODS=CHCAKE+CHCANDY+CHICE+CHCOOK+CHMILK;
NONCHOC=CAKE+CANDY+ICE+CEREAL+MILK;
CHSIPP=NONCHOC-CHFOODS;
CHSWEET=CHFOODS+CHEESE+CHSIPP+SOFTDR;
STRESS=SMOKE+DRINK+DRUGS+TIRED+TENSION+ACHING+HEAD;
LOCARB=PB+BURGER+HOTDOG+YOGURT+CHEESE+CHICKEN+EGGS;
MALFOOD=MILKFOOD+SUGAR+CHEESE+HOTDOG+CHIPS+CANDY+PIES;
   SOFTDR+ICE+CAKE+CHILE+MILK;
TEST=BOTHER+HEADACHE+TENSION+CRAMPS+DIARRH+DIET+HEART+
   LITS+ACHING+BACK+HEAD+SCRAMPS+BEAD+DRESS+TIME;
GLOBAL=STOMACH+BACK+HEAD+SCRAMPS+DIET+HEART+CHEST;
STRESS=SMOKE+DRUGS+DRINK+MONEY+MALEMP;
IF SEX=1 THEN SEX=0;
IF STAGE=1 THEN STAGE=4;
IF STAGE=3 OR STAGE=4 THEN STAGE=3;
PROC SORT; BY IDS
DATA TESTFACE;
INPUT IDS $ AGE SEX ATOS TEAR COLLEGE RACE HOUSING STATE CREDITS
   BREAST FOOD CAMPUS FOODPLAN STRESS VERTICAL PRINCIPAL EXCLUSION
   HOURSWK SUPPORT POPCORN CHEESE CHIPS CHEESE# CHIPS PIZZA
   MONEY CHCOOK CALALCOHOL STICKS HOTDOG CHICKEN CAKES CEREAL PIZZA
   COUNTRY CHIPS RICE# BREADS CHICKS COFFEE# PRIMAL PIES ICE# CHICKS
   VARICET FEAL CHICKENS HAMS TRIGHT "CLOSE FOODS CHILE CHILLNESS
   MOBILE DISASTER STROKE# CLEARBET "SECTION SERVICES SPEN
   REGULAR "BOOKS "BOOK SCARING SCATCHE "BOOKS "BOOK "BOOK "BOOK
```

Appendix Table 11. Determinants of craving for CHOCOLATE foods* in young college students using the regression procedure**

Independent variable	Parameter estimate	STD ERR	Significance	R-SQUARE
WOMEN: Premenstrual stage:				
Stomach pain	1.4335	0.4462	.0017	
Sharp cramps	-1.1641	0.4377	.0123	
Backache	0.6278	0.2652	.0196	
				.3045
WOMEN: All stages merged:				
Tension	0.3435	0.1260	.0009	
Backache	0.3593	0.1501	.0171	
Weakness	0.3651	0.1699	.0321	
Facial blemishes	0.2696	0.1269	.0341	
				.7059
MEN:				
Diarrhea	0.6612	0.2941	.0264	
				.9137

*CHOCOLATE foods tested included the sum of choc. cake, choc. candy, choc. ice cream, choc. chip cookies, and choc. milk.
**Variables used for the regression procedure were significant variables (p(0.10) taken from a preliminary stepwise backwards procedure.

Appendix Table 12. Determinants of craving for NON-CHOCOLATE CONTROL foods* in young college students using the regression procedure**

Independent variable	Parameter estimate	STD ERR	Significance	R-SQUARE
WOMEN: Premenstrual Stage:				
Backache	0.8138	0.2395	.0009	
Weakness	0.9855	0.2928	.0010	
Tension (nervousness)	0.5592	0.1885	.0037	
Dull, aching cramps	0.8567	0.3649	.0206	
				.8246
WOMEN: All stages merged:				
Diarrhea or constipation	0.4362	0.1677	.0056	
Facial blemishes	0.2592	0.1025	.0116	
Tension (nervousness)	0.2189	0.0892	.0145	
Depression	-0.2047	0.0949	.0293	
Backache	0.2625	0.1233	.0338	
Stomach pain	-0.3159	0.1544	.0413	
Weakness	0.2239	0.1348	.0973	
				.7853
MEN:				
No variables were significant at the p(0.10 level				.0724

*NON-CHOCOLATE CONTROL foods tested included the sum of cake, candy, ice cream, cookies, and milk.
**Variables used for the regression procedure were significant variables (p(0.10) taken from a preliminary stepwise backwards procedure.

Appendix Table 13. Determinants of CHOCOLATE DIFFERENCE* in young college students using the regression procedure**

Independent variable	Parameter estimate	STD ERR	Significance	R-SQUARE
WOMEN: Premenstrual stage:				
Dull, aching cramps	1.1808	0.3518	.0032	
Nausea	1.2065	0.5232	.0245	
Stomach pain	-0.5475	0.4348	.0314	
Sharp cramps	1.0341	0.4762	.0320	
Irritability	0.5213	0.2970	.0619	
				.2295
WOMEN: All stages merged:				
Diarrhea	0.5238	0.2020	.0098	
				.0348
MEN:				
Nausea	1.0355	0.5410	.0580	
Diarrhea	-0.5887	0.3318	.0786	
				.0724

*CHOCOLATE DIFFERENCE is defined as the craving scores for the non-chocolate control foods minus the paired chocolate foods.
**Variables used for the regression procedure were significant variables (p<0.10) taken from a preliminary stepwise backwards procedure.

Appendix Table 14. Determinants of craving for HIGH SUGAR foods* in young college students using the regression procedure**

Independent variable	Parameter estimate	STD ERR	Significance	R-SQUARE
WOMEN: Premenstrual stage:				
Stomach pain	2.1462	0.6235	.0008	
Facial blemishes	0.9577	0.2976	.0017	
Tension (nervousness)	0.9577	0.3063	.0024	
Sharp cramps	-1.8411	0.6301	.0042	
Irritability	0.6971	0.3410	.0433	
Feeling bloated	0.5495	0.3053	.0746	
Backache	0.6310	0.3629	.0869	
Dull, aching cramps	0.9122	0.5282	.0869	
				.8031
WOMEN: All stages merged:				
Sharp cramps	-0.5392	0.2571	.0365	
Depression	-0.2605	0.1369	.0614	
Feeling bloated	0.2516	0.1360	.0649	
Stomach pain	-0.3713	0.2082	.0747	
Tension (nervousness)	0.2339	0.1335	.0803	
				.7546
MEN:				
Stomach pain	-1.7189	0.4446	.0002	
Irritability	-1.1381	0.3350	.0010	
Headache	-1.0209	0.4159	.0156	
Sharp cramps	-1.5135	0.7886	.0575	
				.8748

*HIGH SUGAR foods tested included the sum of cake, candy, ice cream, cookies, donuts, pie, and soft drinks.
**Variables used for the regression procedure were significant variables (p<0.10) taken from a preliminary stepwise backwards procedure.

Appendix Table 15. Determinants of craving for HIGH STARCH foods* in young college students using the regression procedure**

Independent variable	Parameter estimate	STD ERR	Significance	R-SQUARE
WOMEN: Preoenstrual stage:				
Tension (nervousness)	-0.7758	0.2517	.0026	
Sharp cramps	1.4062	0.6125	.0335	
Stomach pain	-1.0942	0.5027	.0316	
Facial blemishes	-0.4672	0.2769	.0943	
				.7742
WOMEN: All stages merged:				
Stomach pain	0.6140	0.1997	.0022	
Irritability	0.4282	0.1500	.0053	
Depression	0.2781	0.1250	.0316	
Headache	0.2011	0.1145	.0797	
Diarrhea or Constipation	0.3510	0.2235	.0608	
				.7902
MEN:				
Diarrhea	-1.4208	0.3861	.0004	
Weakness	0.7075	0.3363	.0783	
				.8259

*HIGH STARCH foods tested included the sum of popcorn, french fries, bread or rolls, crackers, potato chips, cereal, and noodles or rice.
**Variables used for the regression procedure were significant variables (p(0.10) taken from a preliminary stepwise backwards procedure.

Appendix Table 16. Determinants of craving for LOWER CARBOHYDRATE foods* in young college students using the regression procedure**

Independent variable	Parameter estimate	STD ERR	Significance	R-SQUARE
WOMEN: Premenstrual stage:				
Stomach pain	-2.9191	0.7676	.0002	
Backache	-1.6042	0.4854	.0013	
Nausea	-2.2523	0.7675	.0041	
Tension (nervousness)	-1.1205	0.3935	.0053	
Depression	-0.9374	0.3520	.0084	
Feeling bloated	-1.0644	0.3582	.0067	
Facial blemishes	-0.9816	0.4437	.0290	
Upset stomach	1.4747	0.6824	.0329	
				.8158
WOMEN: All stages merged:				
Diarrhea	-0.4401	0.2532	.0829	
Weakness	-0.3677	0.2083	.0782	
				.7155
MEN:				
Stomach pain	1.1600	0.4009	.0046	
Depression	0.7803	0.3344	.0214	
Nausea	-2.0542	0.9549	.0320	
Diarrhea	1.1541	0.5884	.0447	
				.8322

*LOWER CARBOHYDRATE foods tested included the sum of peanut butter, hamburger, hot dog, chicken or turkey, pizza, taco or nachos, and ham or bacon.
**Variables used for the regression procedure were significant variables (p(0.10) taken from a preliminary stepwise backwards procedure.

Appendix Table 17. Determinants of craving for ALCOHOLIC BEVERAGES in young college students using the regression procedure*

Independent variable	Parameter estimate	STD ERR	Significance	R-SQUARE
WOMEN: Premenstrual stage:				
Upset stomach	-0.5010	0.2560	.0024	
Dull, aching cramps	-0.6402	0.2175	.0039	
Sharp cramps	0.5415	0.2557	.0364	
Tension (nervousness)	-0.2011	0.1099	.0700	
Weakness	-0.3727	0.2039	.0702	
				.3498
WOMEN: All stages:				
Tension	-0.1362	0.0471	.0040	
Sharp cramps	0.2375	0.0964	.0162	
Dull, aching cramps	-0.2262	0.0941	.0166	
Depression	0.1010	0.0516	.0517	
Nausea	0.1612	0.0965	.0965	
				.2372
MEN:				
Upset stomach	0.5004	0.1386	.0131	
Feeling bloated	0.3743	0.1883	.0491	
Backache	0.2131	0.1085	.0518	
				.2111

*Variables used for the regression procedure were significant variables ($\alpha \leq 0.10$) taken from a preliminary stepwise backwards procedure.

THE MENSTRUAL CYCLE AND FOOD CRAVINGS IN YOUNG COLLEGE WOMEN

by

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ABSTRACT

The effect of the menstrual cycle on food cravings was examined in a population of 83 college women during a six-week longitudinal study. Twenty-one males were used as controls. Food cravings and menstrual symptoms were tested by administration of weekly questionnaires ("craving sheets"). The subjects were not informed that the central objective was to examine the effects of the menstrual cycle on food cravings. The menstrual cycle was divided into four phases: menstrual flow, the first half of the cycle excluding menstrual flow, the second half of the cycle excluding the premenstrual phase, and one week premenstrual. Cravings for 32 foods were examined on a weekly basis under controlled environmental conditions. Foods tested were categorized according to common characteristics.

Women craved chocolate foods more than paired non-chocolate control foods during menstrual flow. No significant differences in cravings were observed when comparing stages of menstrual cycle for high sugar foods, high starch foods, lower carbohydrate foods or alcoholic beverages. The women also experienced more dull, aching cramps and feelings of bloatedness during menstrual flow. There were no differences in food cravings or symptoms when comparing women one week premenstrually with other stages merged.

When comparing men and women (all stages merged) women preferred chocolate foods more than paired non-chocolate control foods, and experienced more headaches and feelings of bloatedness.

Not all women had menstrual symptoms and food cravings. However, several patterns emerged when observing menstrual symptoms as determinants of food cravings. In general, menstrual symptoms were positive determinants of cravings for high carbohydrate foods, and symptoms were negative determinants of cravings for lower carbohydrate foods. This tended to be true for women during all stages of the menstrual cycle (merged), but was particularly apparent during the week premenstrually. Men had about half the number of menstrual symptoms as determinants for the food cravings tested, and no particular pattern emerged for the association between their symptoms and foods craved.